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THE USE OF GAS FOR OTHER THAN ILLUMINATING PURPOSES.

To any one who has given the matter any thoughtful consideratien, it is self-evident almost, that if the distributing part of the plant of any gas company could be as fully employed throughout the entire twenty-four hours as it is from six P. M., to 12, midnight, there would be a very decided reduction in the "cost of distribution," per thousand feet of gas sold.

There are peculiarities incident to the distribution, as well as the manufacture of gas, that do not obtain in water supply, which is more nearly like gas supply than anything else. The capacity of the mains must be equal to the maximum demand, which occurs only during about two hours of the twenty-four on each day, and varies for almost every day in the year. During a large portion of the day the mains are practically unemployed; hence, the interest on the capital invested in those mains must be earned during the short time they are actively employed.

In the same way the manufacturing plant must be largely unemployed during the summer months, owing to the reduced consumption at that time, and yet interest never stops, and, whether used or not, the plant must be ready at all times to meet the requirements of the maximum send-out. All of this is perfectly evident to all managers; but the great fact remains that for years manager have been content to accept the fact without taking active measures to change the conditions at least partially. The problem is, in a few words, "how can an increased *day* consumption be secured"? This is purely a matter of business; and the answer to it is to be found exemplified, in hundreds of cases, in almost every other business enterprise in every city and town in the land.

It is simply in seeking, by every fair and honorable means, to extend the amount of business, and not only this but new channels of trade, and new applications to useful purposes, must be sought out and supplied.

The price of gas in Great Britain is very much lower than in this country. Gas is sold there at prices varying from seventy-five cents to two dollars per thousand feet, and yet the very clever men who manage their works are very wide awake to the necessity of still further cheapening the price of gas to their consumers. in order that they may avail themselves of the increased profits to be derived from an increased business.

At Leeds, England, a very large exhibition has just been brought to a most successful termination, wherein the people were shown, in practical operation, the many economical uses to which gas might be applied. Thousands of people flocked to the great hall to see what was shown—cooking in all kinds of ways; heating apparatus for various mechanical and domestic purposes; gas engines; laundry stoves; soldering iron heaters, etc., etc. The result is already apparent in a large demand for fixtures for these purposes; and, doubtless, the next annual report of the gas company will show a large percentage of increase in the annual make of gas.

In many other cities and towns the same thing is being done. The object, in every case is to obtain increased *day* consumption, and we are glad to see that steps are being taken to extend the day consumption in our own country. Reduced prices are being announced in many places; but the following announcement will put the question to a practical test in one city at least. It would seem almost certain that, at $1.50 per thousand, in a hot climate, gas would distance all competitors.

IMPORTANT TO GAS CONSUMERS.—*Great Reduction in the Price of Gas for Cooking and Heating.*

OFFICE OF N. O. GAS LIGHT COMPANY,
NEW ORLEANS, June 4, 1879.

This company will supply gas for cooking and heating purposes, through special meters, to all its consumers of illuminating gas, at the rate of

$2 PER 1,000 CUBIC FEET,

less 25 per cent. discount for prompt payment. A varied assortment of the most improved gas stoves will be shortly on exhibition at the office of the company, for the rent or sale of which liberal terms will be made with all who desire to use the same.

No charge will be made for meters or meter connections, and no additional deposit will be required to secure payment of bills.

The attention of all housekeepers and proprietors of restaurants and boarding houses is particularly invited to this notice, as no other fuel will compare with gas, at the proposed rate, either in cheapness or convenience.

JAMES JACKSON, *President.*

[Official Notice.]

Office American Gas-Light Association,
117 Broadway, N. Y. City.

To the Members of the Association :

In continuation of the notice printed in May 16th issue of the American Gas Light Journal, the following list of topics is given by way of suggestion to you as comprising topics on which it is desirable that papers should be prepared and read before the Association, such reading to be followed by the usual discussions :

Naphthaline in Coal Gas.

The Relative Advantage and Cost of Purifying Gas with Oxide and with Lime.

The best Means of Removing and Disposing of Foul Lime.

Gas Manufacture in America and in Europe Compared.

On Furnaces for Heating Retorts.

Comparative Advantage of Centre-Valves, Surface and Hydraulic, and other Systems of Valves for Purifiers.

The best Method of Setting Retorts.

On the Price of Coal, and Rate of Wages, as Affecting the Cost of Gas.

Gas for Heating and Cooking Purposes ; the most Economical Methods of Applying.

Deposit of Carbon upon Retorts ; Its Prevention and Removal.

Results of Experiments In Using Different Burners for Lighting Purposes.

On Stoppages in Ascension and other Pipes ; Their Cause, Prevention, and Remedy.

Is the Removal of the Dip Desirable ?

Trussed and non-Trussed Gasholders ; Their Relative Cost and Advantages.

Laying and Connecting Services, and Means for Preventing Rapid Oxidation.

The Cheapest and best Form of Condenser.

The Proper Amount of Labor for the Production of 100,000 Feet of Gas, when the Annual Make is 100 Millions.

The Best Means of Extending the Use of Gas, and How Its Consumption May Be Increased.

Information to Consumers. What does the Consumer Require, and What Is the best Means of Supplying It ?

Proportionate Capacity of Apparatus, and Standards for Capital and Expenditure, per Thousand Feet of Gas Sold.

The Use of Gas as a Motive Power : Results of Actual Experiments, Giving Cost of Power.

Members of the Association are not to understand that the above list prevents them from preparing a paper on any other subject which may suggest itself to them ; but they are especially requested to select any of the above topics, or any other subject which may be agreeable to them to present to the Association, the main purpose being to procure and have the papers and the discussion upon them.

Charles Nettleton, *Secretary.*

Gas Stove Exhibition at Rochdale, England.—On Wednesday morning, May 7th, an exhibition of gas stoves was opened in the Public Hall, Rochdale. It was promoted on the recommendation of the gas committee of the corporation of Rochdale, with the view of affording a practical illustration of the general usefulness and cheapness of gas stoves for cooking purposes. About three months ago Mr. T. O. Patterson, the gas manager, suggested to the gas committee the advisability of such an exhibition, partly on account of the great decrease in the consumption of gas during the summer months, when only 60 retorts are kept working, whereas in winter-time 300 retorts are used, with a proportionate increase of profit. The committee approving of the suggestion, Mr. Paterson invited gas stove manufacturers throughout the country to exhibit their stoves, undertaking to pay the rent of the hall. Only one firm, however, accepted the invitation, namely, Messrs. John Wright & Co. of Birmingham. They exhibited a large selection of stoves, but the variety to be found where a large number of manufacturers exhibit was necessarily missing. The exhibition was, therefore, poor in comparison with those held at Leeds, Bradford, and Wakefield. Messrs. Wright's stoves, however, performed their work most efficiently, and to the evident satisfaction of the large number of people who visited the hall. Indeed the delicious hot joints, the broiled chops and steaks, and the nicely-baked loaves of bread, were more than sufficient to shake the prejudices of the most sceptical and fastidious.

On a Recent Trip of one of the steamers running to San Francisco, bread was served at dinner one day which tasted strongly of coal oil. The captain afterward asked the baker if he did not know that kerosene had got into the flour. He admitted that he did. "Why didn't you feed the flour to the chickens ?" was asked. "Oh," he replied, "I was afraid it would kill them."—*Plumber and Sanitary Engineer.*

[From London "Journal of Gas Lighting."]

Experiments on Generator Furnaces.

By "Isca."

I.

A Commission appointed by the German Gas and Water Managers Association to investigate the working of gas generator furnaces under variations of draught, has issued a voluminous and exhaustive report, parts of which have from time to time been published *in extenso* in the *Journal fur Gasbeleuchtung*. It contains much interesting information gathered from a multitude of experiments, the conditions of which are noted with great care, and the results obtained therefrom are set forth with that painstaking attention to detail which is generally found characterizing German research in other fields of inquiry.

It is obvious that the question of the draught with which these furnaces are worked is one that contains within itself the whole principle upon which their construction is based. A brisk or a slow draught to any fire means all the difference between a large supply of oxygen and the reverse ; between the constitution of the effluent gaseous products of combustion under the several conditions.

It is impossible to speak too highly of the labors of the Commission, who seem to have been unremitting in their attention not only to the chemical examination of the gases themselves—frequently making analyses for CO and CO_2 at intervals of 15 minutes—but also recording their observations on the practical working of the furnace, and making impartial comments thereon, which are of importance in explaining or qualifying the theoretical results.

The experiments were carried on at Liepzeic, with coke from Zwickau coal, which was sometimes used in its ordinary "through and through" state, and on other recorded occasions was carefully sorted, and only the large coke burnt. Generally speaking, there does not appear to be much advantage in picking the coke, as long as it is clean, and free from foreign substances.

The first experiments were made with the lowest possible draught—in fact, when the fire was started there was no draught at all, and only the very slight vacuum of 0.004 inch was subsequently allowed. Under these circumstances the comsumption of coke was of course very small, and no working result was secured ; but the formation of CO was decidedly well marked. The highest observed draught was 0.444 inch, which seems to have been the greatest vacuum attainable by the Commissioners with an open damper, and the consumption of coke rose considerably, but not in anything like the same proportion, for although the draught was increased one hundred times, the consumption only increased rather over four times. Between these extremes many experiments were conducted, under conditions and with results as shown in Tables I., II., and III., which are appended to this article, and which explain themselves. The "slits" mentioned are the openings in the bottom of the generator for the admission of air ; they were, however, removed in some of the experiments, to make way for a "grate," or fire-bars. These slits were made in specially constructed fire-tiles, but gave much trouble by becoming fused with the clinker, which was also a source of great trouble with the grate or fire-bars, even to the point of interrupting the continuous working of the furnace by preventing the admission of air, until special means were devised for surmounting the difficulty. In fact, the clinker was frequently so hard and thick that no impression could be made on it with the ordinary clinkering bars, and if it had not been conquered the whole system would have been rejected as impracticable in ordinary working.

One of the side issues of these experiments was the question of the permeability to atmospheric air of the brickwork composing the generator furnace itself, which was conclusively proved. It is stated that, the furnace having been repeatedly heated and cooled, the walls were fissured with innumerable cracks. Those most evident were carefully stopped with fire clay, yet the leakage was very considerable, and its effect in increasing the percentage of CO_2 in the gases had to be allowed for. This is very evident in experiments E and F, which were made with one slit only. the consequence being a reduced consumption of coke, owing to the restricted supply of oxygen through the fuel from the bottom, while the infilitration through the walls was as rapid as when the furnace was in full activity.

Returning to the comparison of the slit generator and the grate generator, it was noticed that there was less residue with the latter than with the former, chiefly because the slits were of greater width than the spaces between the fire-bars. It was also observed that a great deal of the difficulty experienced in keeping the furnace clear for the passage of the draught through the fuel was due to the fact that the incandescent coke and dust formed an arch or dome extending over the area of the furnace at some distance above the grate level, so that although the cinders might appear perfectly loose at that point, the upper portion of the charge would be entirely

shut off from any supply of air. The proper breaking up of this dome of ashes and clinkers was a very troublesome duty.

With the object of rendering the clinker brittle or friable, so as to be more easily removed without destroying the cheeks of the furnace, the effect of the admission of steam was next experimented with.

The first circumstance noted was that the temperature of the effluent gases did not appear to be materially affected by the steam admitted to the fire. When no steam was used, the gases at the outlet were found to have a temperature of 1,562° Fahr. When steam was introduced under the grate of the furnace at the rate of 620 kilogrammes per 12 hours, the temperature at the same point was 1,706° Fahr. It appears, therefore, that the heat lost by radiation and conduction, when worked "dry," can be used for decomposing a considerable quantity of steam without lowering the effluent gases to any great extent. In fact, as a result of the experiment subsequently carried out, it was found that steam, when admitted within certain limits as to quantity, becomes truly decomposed, and the oxygen being taken up by the slag and the carbon, the uncombined hydrogen is burnt with good effect.

At an early period of the experiments with steam the clinker was observed to be effected in a manner which seemed unmistakeably to indicate that it might possibly be softened, and ultimately disintergated, by that agency, provided that the quantity required should prove to be under the point at which a sensible lowering of the heat of the gases would take place. This important question, holding out, as a consequence of its satisfactory solution, the benefits of regular working, as well as the avoidance of a great amount of arduous labor, was considered worth a special series of experiments, to determine the proportion of steam to coke which would best satisfy the two conditions above mentioned.

TABLE I.—*Comparative Conditions of Experiments.**

Experiment.	Conditions of Experiments.			Consu'ption of Coke during Experiment.		Consumption of Coke in 24 Hours.	
	Number Hours.	Average Pressure in the Gas Channel.		Gross Weight.	Residue	Gross.	Less the Residue.
		Inch.		Kilos.	Per Ct.	Kilos.	Kilos.
A	13	—0.004	Unsorted Coke 2 slits.	330	13	609	530
B	12¾	—0.063		525	13	988	860
C	15½	—0.043		604	13	935	813
D	22	—0.301		1500	12.1	1637	1440
E	11	—0.297	Unsorted Coke 1 slit.	580	13	1265	1100
F	24	—0.267		1096	13	1069	930
G	17	—0.173	Coarse Coke. 2 slits.	1203	12.7	1698	1482
H	20	—0.444		2160	12.7	2592	2264
I	16	—0.067		860	13.7	1290	1113

TABLE II.—*Chemical Composition of the Heating Gas.*

Experiment.	Average Pressure in the Gas Channel.	Quantity of		Number of Slits.
		CO_2.	CO.	
	Inch.	Per Cent.	Per Cent.	
A	—0.004	3.6	23.8	Two.
C	—0.043	2.7	24.6	Two.
B	—0.063	4.8	23.0	Two.
I	—0.067	4.5	25.7	Two.
G	—0.173	3.8	23.4	Two.
F	—0.267	6.6	18.8	One.
E	—0.297	9.5	13.5	One.
D	—0.301	6.9	21.5	Two.
H	—0.444	5.9	17.9	Two.

TABLE III.—*Consumption of Coke and Quantity of Residue During the Period of 24 Hours, in the Slit Generator Furnace.*

Consumption of Coke.	Total Residue.		Composition of the Residue.						Quantity of Gasified Coke less Residue.
			Coke.		Ashes.		Clinker.		
Kilos.	Kilos.	Per Ct.	Kilos	Per Ct.	Kilos.	Per Cent of Gasifi'd Coke.	Kilos.	In Per Cent of Gasifi'd Coke.	Kilos.
1380	82	5.94	7	0.51	26	1.88	49	3.55	1292
1025	175	17.07	8	0.78	68	6.63	99	9·66	850
912	203	22.26	6	0.66	73	8.	124	13.60	709
1534	185	12.06	4	0.26	68	4.43	113	7.37	1349
1400	162	11.57	4	0.29	65	4.64	93	6.64	1238
1384	176	12.70	13	0.92	76	5.50	87	6.30	1208
2203	280	12.70	20	0.92	121	5.50	139	6.30	1923
1905	262	13.75	36	1.91	141	7.41	85	4.43	1643
350	48	13.75	7	1.91	26	7.41	15	4.43	302
12093	1573	13.01	105	0.87	664	5.49	804	6.65	10520

* 1 kilo. = 2.2046 lbs.

II.

The first series of experiments, an account of which is given in the first part of this article, was brought to a close in April, 1878, with results already tabulated. The general significance of these was, that the admission of steam into the furnace was a thing to be desired, with a view to the removal of clinker, and it then became necessary to obtain accurate data as to the exact degree to which the application of that agent could be satisfactorily carried out; and, of course, the quantity of steam that would be required.

For the purpose of the second series of experiments which were instituted with this object, the generator was fitted with a grate, or fire-bars, as in the former case, and a steam inlet was provided from a vertical boiler, fitted with a suitable valve, and terminating underneath the middle of the fire-bars in a perforated pipe of about 20 inches long. During the experiments the same strength of draught was maintained, and, consequently, a uniform rate of combustion was ensured, while larger or smaller quantities of steam were admitted. Every twelve hours the refuse ashes and clinker were removed as before, by putting in a false grate above the one in use, which was then withdrawn, and the quality of the refuse examined. It was soon found that with too little steam a hard cake of clinker was formed over the bars, preventing the regular admission of air, and making cleaning difficult. When more steam was introduced, the quantity of clinker was lessened, it was rendered brittle, and the entire refuse, under well-conducted working, was composed of small pieces of clinker mixed with loose porous ashes, which could be easily removed from under the bars every ten or twelve hours.

It was thus proved that steam could be used without disturbing the working, and, therefore, the next thing to be ascertained was the quantity required to give the best results. This was not an easy matter, especially as the method previously adopted, of weighing the steam at the inlet, was observed to give inaccurate data, owing to the fact that it was never altogether consumed in the furnace, for a portion always escaped outwards, and a further percentage was condensed in the ashes, particularly towards the end of an experiment. Another way, and the course which was ultimately followed, was to test the chemical components of the effluent gases. Former experiments had shown that the whole of the steam would be decomposed in passing through the glowing fuel in the generator, and the hydrogen would be set free; at least, this would be true up to a point which should not be exceeded in regular working. The heating gases produced by the admission of dry air contained but a trace of hydrogen, and, therefore, the quantity of steam used could be easily determined from the amount of hydrogen present in the gas.

The preliminary arrangements being thus settled, the operations were commenced, and the results are contained in the accompanying table.

In experiment A, with an average draught of 0·11 inch, 1176 kilos. of coke were consumed in 24 hours, the combustion during that period being uniform, and the refuse not being removed until the expiration of that time, when it was examined, and found to consist of porous, coherent, but brittle clinker, easy of removal. The consumption of steam was found to have been 0·42 kilo. for every kilogramme of coke. From the presence of brittle pieces of clinker, the quantity of steam was considered to have been too small. The temperature in the gas channel was observed to be 1220°F.

An experiment (B) was now made with a stronger draught. With an average vacuum of 0·24 inch, the consumption of coke was found to be 1641 kilos. per 24 hours, less the residue. The quantity of steam let in was found to be 0·39 kilos. per kilogramme of coke. On examination of the refuse, pieces of clinker as hard as stone were found, especially at the sides; consequently, the admission of steam has still been too small.

The following experiment (C) was then made with the same draught, but with more steam. The quantity of CO_2 increased considerably, and 1·17 kilos. of steam was used to every kilogramme of coke. The heat, however, which was produced by the combustion of the coke in the air admitted with the steam, was not sufficient to effect the proper decomposition of the latter; and the consumption of heat in the generator being thus greater than its production, its temperature gradually decreased, and increasing quantities of undecomposed water escaped, until the elimination of hydrogen entirely ceased. After ten hours working, the effluent gases contained 19 per cent. of CO_2, and small quantities of CO, with a great deal of steam. The latter had lowered the temperature of the generator so much that only feebly glowing coke was found on the damp ashes when the deposit on the bars was examined, and these dull embers would have been quite extinguished, if the working had been continued under the same conditions. The quantity of coke burnt had, of course, considerably decreased, for during sixteen hours the consumption, less the residue, was only after the rate of 576 kilos. per 24 hours. Thus, evidently, with the admission of 1·17 kilos. of steam per kilogramme of coke, the limit of successful continuous working was exceeded.

In order to get the generator again into working order, the steam-cock was closed, and in 4½ hours the entire contents of the furnace were in a live-

ly, glowing condition. The steam-cock was then suddenly opened full, and a great quantity of steam let in. In ten minutes a sample of the gas showed that the quantity of steam decomposed was 1·62 kilos. per kilogramme of fuel. Judging from former experience, such an active decomposition could not be expected to last long, and the cooling effect naturally produced a large quantity of CO_2. In not more than 20 minutes the gas contained much more CO_2, less H, and the analyses of the gas taken at intervals, showed as follows :

	20 Min. Per cent.	50 Min. Per cent.	2 hours Per cent.	Average. Per cent.	
CO_2	17·0	17·0	16·0	16·3	26 per cent. carbon gases.
CO	9·4	9·2	10·4	9·7	
H	20·0	16·7	18·2	18·3	28 p.c. of combustible gases.

The heat which had accumulated in the generator was exhausted, and, had the experiment been continued, the same result as in experiment C would have ensued. The admission of steam was, therefore, reduced (experiment E) with the same draught, and, after four hours' working, the analyses of gas showed—

CO_2....10·8 per cent. CO....16·2 per cent. H....13·6 per cent.

At the end of the experiment the pressure of steam had increased, and the gas contained—

CO_2....13·6 per cent. CO....15·6 per cent. H....16·1 per cent.

The first analysis shows a steam intake of 0·76 kilo., and the second 0·82 kilo. per kilogramme of coke—average 0·79 kilo. for the whole period. The consumption of fuel, less residue, was 1088 kilos. per 24 hours. The refuse was removed at the end of the experiment, and was found to consist chiefly of porous ashes mixed with small pieces of brittle slag, and could be removed with ease. The fire was bright, and the *working could be considered good and normal.* The temperature of the gases was found to be about 1382° F.

In order to verify the above results, the working was continued with the same draught, but with less steam (experiment F).

The analysis of the gases, taken at the end of four hours, showed a decomposition of 0·41 kilo. of steam per kilogramme of coke. In nine hours the refuse was examined, and a considerable amount of partly caked clinker was found. The steam consumed had, therefore, been insufficient. The steam-cock having been opened (experiment G), the steam intake rose to 0·70 kilo. per kilogramme of coke, and the trial was continued for 17 hours with draught varying from 0·04 to 0·08, after which the refuse was removed without any difficulty. The temperature of the gas at the end of the experiment was about 1418° F.

These experiments evidently go to show that with the Zwickau coke under examination, a regular consumption of from 70 to 80 per cent. of steam to coke, by weight, was necessary to ensure good average working and the prevention of clinker.

The results of the series of experiments are classified, in the order of the consumption of steam, in the following table :—

Comparative Statement of the Results of Experiments with a Generator Furnace with Steam Inlet.

No.	Experiment.	Pounds of steam per lb. of coal.	Chemical Composition CO_2 Pr.ct.	CO Pr.ct.	H Pr.ct.	N Pr.ct.	Carbon Gases.	Combustible Gases.	Inert Gases.	Draught in flue. In.	Temperature of the Gases.	Remarks.
	1	2	3	4	5	6	7	8	9	10	11	12
I.	D	.30	7.1	21.7	6.2	65.0	28.8	27.9	72.1	.08	—	Too little steam.
II.	B	.39	8.2	20.8	7.5	63.5	29.0	28.3	71.7	.24	—	
III.	F	.41	7.0	21.4	7.7	64.3	28.2	29.1	71.3	.04	1382	
IV.	A	.42	6.8	22.9	8.3	62.0	29.7	31.2	68.8	.11	1220	
V.	G	.70	8.0	19.0	12.6	60.4	27.0	31.6	68.4	.08	1418	Good working.
VI.	E*	.76	10.8	16.2	13.6	59.4	27.0	29.8	70.2	.09	—	
VII.	E†	.79	12.2	15.9	14.9	57.0	28.1	30.8	69.2	.09	1382	
VIII.	E‡	.82	13.6	15.6	16.1	54.7	29.2	31.7	68.3	.09	—	
IX.	D‡	1.05	16.3	9.7	18.3	55.7	26.0	28.0	72.0	.08	—	Too much steam; continuous working not possible.
X.	C	1.17	14.8	8.5	18.1	58.6	23.3	26.6	73.4	.24	—	

A comparative examination of the above table shows certain regular features which are worth particular attention. First, it will be noticed that the quantity of CO_2 increases with the amount of steam admitted, as does the H in similar proportion, while the CO decreases (columns 3, 4, and 5). This seems to indicate that the steam is more easily decomposed into H than the CO_2 is reduced to CO. Columns 7, 8, and 9 show respectively the quantities of carbon gases (CO_2 and CO) of the combustible portion (CO and H), and the inert gases (N and CO_2) in the gases produced with different quantities of steam. Generally speaking, also, the percentage of combustible gases increases with the admission of steam, until that equals 0·82 per cent. of the carbon consumed—that is, until it arrives at the point at which proper combustion ceases to be possible, when the quantity of combustible gases decreases, and the inert gases increase proportionately. These relations are of a decisive nature when considered in judging of the economic performance of the generator when worked with steam.

* First period of the experiment at which observations were made.
† Middle period. ‡ Third period.

Two things must be specially considered in this matter—(*a*) the consumption of carbon in the shape of fuel per unit of heating gases produced, and (*b*) the calorific value of those gases.

The value of the effluent gases as heating agents, of course, depends entirely upon the percentage of combustible ingredients contained therein. This is ignoring any possible work performed by the inert gases when yielding up the heat which they carry away from the furnace. For practical purposes, the values of H and CO as combustibles may be taken as being equal, when measured by volume ; hence, from an economic point of view, that working may be considered best which produces a mixture of gases containing as little as possible of the carbon gases CO_2 and CO, and as much as possible of CO and H.

When comparing, upon this principle, the numbers in columns 7 and 8 of the table, the smallest quantity of carbon gases, together with the highest per centage of combustible ingredients, will be found in Nos. V. to VIII. : *e. g.*, when the steam intake was equal to from 70 to 80 per cent. of the coke consumed—a rate of admission which was also proved to be the best for the avoidance of clinkering.

The consumption of fuel in the production of the steam is not taken into acount.

Reasoning from the facts developed above, a comparison may be drawn between the performances of a slit-generator with dry air, and of a grate-generator worked with steam. The table shows that when little steam is admitted the quantity of carbon gases produced is greater than that of the combustible gases ; consequently, the consumption of fuel is correspondingly greater than when the reverse is the case. With the dry air generator the percentage of carbon gases is always higher than that of the combustible ingredients, by at least 2 or 4 per cent., and the quantity of the latter is always less than with steam.

The following comparative statement of the two systems, working under similar conditions, will exemplify the differences in the performance of each.

I.—*Slit-Generator, without Steam.*

0·066 in draught, 1113 kilos of coke per 24 hours.

CO_2	4·5 per cent.
CO	25·7 "
H	——
Carbon gases	30·2 "
Combustible gases	25·7 "

II.—*Grate-Generator, with 0·7 Kilo. H_2O per Kilo. of Coke.*

1088 kilos. per 24 hours.

CO_2	8·0 per cent.
CO	19·0 "
H	12·6 "
Carbon gases	27·0 "
Combustible gases	31·6 "

Quantity of coke required for the production of one cubic metre of heating gases—

Slit-generator, without steam	0·162 kilo.
Grate-generator, with 0·7 kilo. H_2O per kilo. of coke	0·145 kilo.

Thus, in the second example, the gas produced contains a higher proportion of combustible ingredients, with a less consumption of fuel, the quantity of coke used in the generator only being taken into consideration.

The result may, in some degree, be accounted for in the manner pointed out in the first part of this article, by the considerable loss of heat accompanying dry working, caused by the high temperature of the generator, which, in the second case, is much lessened, and partly utilized in decomposing the steam and producing hydrogen.

III.

The importance of experiments such as those described in the earlier portion of this article is unquestionable, whether in respect of their own particular scope and interest, or in view of the light which may be thrown on other subjects, sometimes little related apparently, by the records of observations carefully made and verified. Instances are common where the almost casual remarks of experimenters, respecting facts which came under their notice while engaged in some inquiry to which incidents have been subsidiary, have been seized upon by other investigators, who have per

ceived their meaning in some widely different connection, and have followed to their proper application the hints thus obtained.

The danger in conducting experimental research is commonly found to lie more in the omission of necessary notes than in unnecessary amplification of them. This is made evident upon a careful consideration of the report which has been here examined. In one point especially, the report arouses curiosity, but does not satisfy it, and that is in mentioning the observed permeability of the brickwork of the generator furnace by air. That this is a fact is clearly stated; but, with all due respect be it said, the mere circumstance is not surprising, for the phenomenon has long been known. With the facilities which were apparently at hand for exact observation, it is a pity that when this effect was noted, and to such an extent that it was necessary to adduce it in evidence, in order to explain some otherwise conflicting or unaccountable results, some endeavor was not made to overcome it, or at least to determine its value, and so eliminate it from the problems to be solved, instead of leaving it as a disturbing element, to the prejudice of the conclusions ultimately tabulated.

Closely following on these qualifying considerations, and, in fact, forming part of the same train of thought, is the suggestion that the quantity of air intentionally admitted to the furnace should have been stated with more exactness than by describing it as by one slit, or by two slits, or by a grate. Although some indications of this quantity may be observed in the varying proportions of CO and CO_2, in the gaseous products of combustion, it would be useful and instructive to verify these ratios by reference to actual volumes, which cannot now be done. It would be valuable to compare the volume of air drawn into the furnace at the bottom, by varying powers of draught, with the constituents of the effluent gases; and the information thereby obtained would be of great assistance, not only towards determining the velocity of the air through the fuel which might be relied on for securing the best average effect, but would probably lead to tolerably exact measurement of the air which penetrates through the brickwork of the furnace, by comparison of the theoretic constitution of the gases were that influence non-existent, with the composition as actually found by analysis.

The class of experiments which had as their object the determination of the quality of steam which would, if introduced into the furnace, prevent the formation of clinker, or cause important modifications in its nature, is worthy of particular study. That this object was eventually attained is placed on record; but it will probably be somewhat surprising to many to learn that an observed admission of water in the form of steam, equal to 80 per cent. by weight of the coke consumed, was attended by no disadvantage to the constant maintenance of the action of the fire. It will probably be safe to assume that this could only be true in cases where the incandescent fuel exists in considerable depth, for otherwise the steam could not be reduced to its elements, which appears to have been the case here. The presence of free hydrogen in the gases carried forward from the regenerative chamber, at the same time that those maintained a temperature as high as, or even higher than had been observed when no steam was admitted, shows that a great amount of additional energy must have been developed in the chamber, in excess of that obtained without the steam, in order to effect its reduction *within the furnace*, and still pass on hydrogen unconsumed. That additional energy plainly could not have been due to the combustion of the effluent hydrogen, and the question naturally arises, where did it come from? If it was due to any combustion of hydrogen in the furnace, which thus yielded up its power before leaving the contact of the fuel, it is evident that the method adopted by the Commission, of estimating the total admission of water by the percentage of free hydrogen in the gases, was not correct, inasmuch as it could not include the portion consumed almost as soon as formed. If this hypothesis be rejected, the only solution possible is that the steam acted as a blast, and consequently caused a brisker current of air to enter the fire, just at the point where its own cooling action would be most marked, and by the same means would render the register of pressure in the gas channel misleading as an index of the quantity and character of the supply of air.

It is well known that the effect of water in a combustible, or of hydrogen and oxygen in the proportion in which they constitute water, is detrimental to the efficacy of the combustible as a source of energy. Now, steam is, of course, water, and the point offered for consideration is the difference observed between the effects produced by feeding a fire with fuel containing 80 per cent. of water, and by the injection of that proportion of water into the fuel when already heated to the full extent of its capacity. If the results, as to this point, observed in the examples which form the subject of this article, can be generally secured, a field of great promise is opened up to careful investigators. The impression which would be formed in the mind of any one, on a hasty glance over the descriptions of the experiments which are classified as presenting the effect of steady working, with the regular addition to the fire of about 80 per cent. of its weight of water, would naturally be that either the commonly accepted theory respecting the effect of the presence of water in a combustible is wrong, or that the recorded results of the experiments are misleading. Neither is the correct conclusion; nevertheless it would be highly desirable to make extended tests of this apparent action of steam upon heated fuel, when injected with air admitted in the usual way.

Another interesting problem may be found in the question as to what became of the oxygen of the steam, of which the hydrogen was driven forward. Some of it was, of course, combined with carbon, forming one source of the carbon gases referred to. But did any of it enter into and change the constitution of the clinker? We are not favored with the chemical composition of the clinker, either when formed in the dry process, and then, as we are told, extremely hard and solid, or in the porous and brittle condition to which it was reduced by the admission of steam. The Commission appear to have been content with the good results they secured in respect of its removal in the latter condition, and did not inquire very closely into the means by which that desirable effect was produced. We are consequently left in the dark as to whether the change was merely one of form or of nature; in other words, whether the steam acted by itself mechanically, or chemically by its components. This, again, if decided, would have indicated the part of the furnace wherein the clinker was formed; that is to say, in what gaseous envelope its formation may or may not be expected. The attainment of a perfectly clean fire, or one in which the carbon of the fuel is converted throughout into its gaseous compounds with oxygen, and the incombustible portions are left behind in the same independent particles, or nearly so, as must have existed before ignition, instead of fusing into a troublesome mass, is something so greatly to be desired, that anything which seems to offer the faintest indication of its probability is worth minute investigation.

These various suggestions, it is scarcely necessary to state, are made without the slightest desire to detract from the value of the experiments as recorded, or to ascribe anything but the most painstaking work to the Commission which organized and superintended them. Perhaps it was felt that the observations made were all that was neceessary to afford intelligible bases for the opinions expressed. Still, it must be admitted—and the learned reporter, Dr. Bunte, of Munich, would probably be the first to assent to the remark—that perhaps the most valuable result of the labors of himself and his *confreres* is to be found in their suggestiveness, and that very much more remains to be done to render them perfect.

Admirable as far as they go, these investigations would seem to require supplementing to a very considerable extent, before the correlative questions raised by them can even be considered approximately solved. Whether this can be be better done by a Commission or by individual effort, is a matter on which opinions may differ. A commission has many advantages of continuous and well-directed action, and its labors are always subject to the revision of many interested witnesses; but, on the other hand, a greater number of experimenters may be engaged, in independent but common research. Results are then abundantly checked, and incidental points noticed by many observers, and the entire field of inquiry is generally cleaner swept when there is a gradual advance along the whole line, than when a single brilliant charge sometimes captures an important position, but leaves a number of points unoccupied on either flank.

The Bye-Products of the Distillation of Coal.*

Read at the Conference du Trocadero, Paris Exposition.

By Prof. Bertin.

(Continued from page 252.)

Let us return to the products of the distillation of tar, that is to say, to the heavy and the light oils.

Before reviewing the various treatments to which these oils are subjected in order to extract the numerous bodies which they contain, I will dwell for a moment on the use of the heavy oils of tar in the preservation of wood. I will take for an example, if you please, the ties or sleepers in use on railways.

You know that formerly wood was preserved by injecting it with sulphate of copper. Why, then, has the sulphate of copper been displaced by the oils of tar? Formerly, under the old system, the wood did not remain in a state of preservation a sufficient length of time. The new mode, it is true, is still in the stage of experiment, but there are reasons for believing that better results will be obtained. The injection of railroad sleepers with heavy oil of tar instead of with sulphate of copper was begun at the same time with laying steel rails; it is believed that these ties will now last quite as long as the rails.

This substitution was made for the following reasons: Sulphate of copper, in presence of organic matter. becomes decomposed, since it takes from the air a portion of its oxygen in order to reconstruct itself. In other words, a chemical action takes place in the wood, disintegrating it. Furthermore, especially in the case of railway ties, a slight galvanic action takes place at

*Translated from *Journal des Usines a Gaz* by A. P. Trautwein.

the iron chairs, which is another source of integration. Add to this the fact that the sulphate of copper of commerce is almost invariably acid.

For these various reasons, sulphate of copper has been displaced by the heavy oils of tar, and since organic substances are thus injected in the presence of organic matter, decomposition does not seem to ensue, at all events not so rapidly. It is customary to inject, on an average, 15.7 gallons of heavy oil per cubic foot of wood; the following, in a few words, is the operation: The ties are first warmed by means of steam heat to a temperature of about 40° to 50° C., and are then subjected to a temperature of from 60° to 65° in ovens. They are then placed into cylinders, a vacuum is created, the oil is allowed to flow in and completely fill the cylinders, and a pressure of from 75 to 90 pounds per square inch is next exerted.

The crude heavy oils of tar contain naphthaline in great abundance; it is essential that they be deprived of this as far as possible, since even at ordinary temperatures it would solidify and crystallize in the pores of the wood, thus obstructing the cells and preventing the oil from further penetration. Here are two specimens of ties inpregnated with heavy oil; one is a piece of pine. It is possible to trace readily the penetration of the heavy oil, but the heart of the wood remains intact; the adjacent cells did not permit the oil to penetrate these. The sapwood alone is found to be saturated, but this is sufficient to preserve the tie. You also notice that in this piece of oak the heavy oil stopped in the sapwood; this, too, suffices to preserve the wood.

Let us now see how the oils from coal are treated.

The naphthaline is first extracted from the heavy oils; in comparison with the other bye-products, however, it is used but very little. It is useful in protecting plants from insects which, while they are not destroyed by it, are compelled to shun it. In medicine it is employed in certain skin diseases. These uses for naphthaline are but very limited; we will now note a more industrial application.

Notwithstanding the numerous attempts which were made with a view to prepare coloring matters, there are known at the present day but a very limited number of colors derived from naphthaline, which really find an industrial use. I propose to show you one of the most stable, Bismarck brown. If I throw a few pieces into this glass of boiling water and dip this piece of linen into it, I obtain this beautiful coloration without any mordant or other preparation of the fabric. From the heavy or "dead" oils of tar, phenol, phenylic or carbolic acid is also extracted, whose applications are numerous, and which principally serve to prevent the putrefaction of animal matter. The extracting process is based upon the fact that the phenol dissolves in alkalies, while the neutral and basic salts are insoluble.

The derivatives of phenol are rosolic acid or coralline, and azuline, which are used as coloring matters, and picric acid, whose coloring power is so great that seven grains are sufficient to dye one pound of silk. This picric acid, when combined with potash, forms a highly explosive body. You may remember the terrible explosion which followed a manipulation of picrate of potassium at the laboratory of the Messrs. Fontaine in the *Place de la Sorbonne*. Here is this acid with its marked brown color, and here the phenylic acid which is perfectly colorless.

By oxidizing tetrachloride of naphthaline by means of nitric acid, phtalic acid is obtained. Among the combinations of this acid with phenol, it is necessary to point out fluorescine, discovered some years ago, which yields a very fine reddish-brown color. The tetrabromide of fluorescine is known under the name of Eosine, a specimen of which you see in this bottle. Fluorescine is employed in the manufacture of red inks, particularly such as are used in ruling blankbooks, &c.

These are the principal bodies which are extracted from the heavy oils of tar. In speaking of light oils we shall find bodies whose application in the industries are much more numerous and more universal.

The treatment to which these oils are subjected consists in adding, in the first place, sulphuric acid and then caustic soda, when the resulting product will be found to be benzine or benzol. This body is well known to all of you; it enjoys the property of dissolving all fatty substances, and is hence used in cleaning fabrics impregnated with lime. This benzine, again, whose strong and disagreeable odor pursues you so persistently as though to testify that the stains no longer exists in your clothing; this very benzine is used in making a perfume known under the name of "essence of mirbane" or nitrobenzine, an oily body which, owing to the resemblance of its odor, serves to replace the essence of bitter almonds in general perfumes.

Benzole is used for dissolving caoutchouc and gutta percha, and for producing the very thin films of these bodies which render paper transparent without leaving any trace whatever after having volatilized; it is employed for dissolving fatty bodies, resins, &c., and, finally, to form nitrobenzine.

Benzole by a series of remarkable transformations leads us, in some way, to the preparation of all colors. Reduced by nascent hydrogen, nitrobenzine yields a new substance, aniline.

Aniline is the basis of a flourishing industry which, originating but very recently, is remarkable not only for the amount of capital which is engaged in it and the vast interests which are connected with it, but also for the beauty of its products, the variety of research to which it has lead and the importance of the scientific work to which it has given rise. With this aniline are produced those dazzling colors which meet our eyes these past few years, and which, with the undeniable merit of hitherto unknown purity and effect, possess the additional merit of remarkable cheapness. Unfortunately, in the latter part of 1872, M. Chevreul in a report addressed to the Academy of Sciences drew public attention to the want of permanence in the aniline dyes They are in fact excellent for those stuffs which are subject to fashion, and hence are destined to be renewed frequently, but not so, owing to their instability, for furniture stuffs and others, which must last longer.

We will now review, if you please, the principal coloring matters derived from aniline. They are numerous; some of them have been well studied, others are hardly known even to science.

Aniline violet is made directly by mixing in proper proportions, aniline with sulphuric acid and bichromate of potash. The liquid after sometime is agitated, and if then set aside there is found in the bottom of the vessel a pulverulent black deposit, which, when treated with alcohol, yields a beautiful violet color, aniline violet. Here is some aniline, here some aniline violet; you will notice that this solution is of a remarkable beauty and purity.

To produce aniline red, the method consists in acting upon aniline with anhydrous bicloride of tin (liquor of libavius). The two colorless liquids mingle, and, upon applying heat, a violent ebullition takes place; the mass solidifies and forms crystals in abundance, which fuse under the action of the heat. The mass, little by little, then turns brown, increases in intensity until, finally, it becomes a beautiful deep red. The process most commonly displayed is the "arsenious acid process;" but it would be desirable if a different means were found of transforming aniline, economically, into red coloring matter, for the use of a body so poisonous as arsenious acid has already caused some terrible accidents. I may remark, however, that in works conducted by competent chemists these accidents do not occur, or at all events but very rarely. Aniline red is also known as fushsine, solferino red, magenta red, roseine, &c.

By warming for a few minutes this aniline with aniline itself, the mixture becomes violet, and by continuing the operation a sufficient length of time, the mass turns perfectly blue. In this way the fine aniline blue is obtained, whose vividness is not even surpassed by the aniline red of which I spoke a few moments ago. I will show you a solution of it in water.

Here again is the aniline orange, whose tone is of extraordinary mildness. The transformations of aniline do not, however, stop here; under proper conditions it yields in addition to the colors which I have cited, the green, brown, black—in fact, the entire scale of colors. You will notice on this table the greater part of the colors derived with aniline as the base. This collection constitutes an almost complete series of the known colors.

If the preparation of all of these colors is easy, their use is quite as much so. By means of these samples I desire to demonstrate the readiness with which fabrics can be dyed.

Such, ladies and gentlemen, is the series of derivative colors from aniline. These are the principal products from coal to which I intended to direct your attention. It certainly was not my design to initiate you into all the details in the manufacture of the derivative products from coal. My only wish is that upon leaving here you may, if you will, permit me to use the expression, have had a slight *dyeing*.

In view of these results I might remark in conclusion, that these wonderful discoveries were not made at once; they are the result of persevering labors which were carried on for many years on the coal tars, and were I to cite the history of these labors, I would have to mention the names of some of the most illustrious savans of all countries.

Registering the Wind.—An apparatus of simple character for recording continuously the direction of the wind is now in use at the Observatory of Lyons. It was constructed by M. Redier. A weathercock of suitable form is supported by a sort of tripod of grooved wheels running upon a circular rail of steel (the wheels having individually a horizontal axis, but collectively, a vertical). From the weathercock passes down a vertical rod to connection with a cylinder (placed with axis vertical), which is supported below by a steel pivot resting on a plate of agate, and is guided at the upper part by horizontal pulleys. Thus each movement of the weathercock is transmitted to the cylinder. The latter has wound round it a sheet of paper, graduated vertically and horizontally (the vertical divisions representing the hours, the horizontal the directions), and a pencil applied to the paper is moved in vertical directions by clockwork. It will thus be seen that the tracing obtained on the paper indicates the successive positions taken by the weathercock, and, accordingly, the direction of the wind for any given time.

[Official Report.]

Western Gas Association.

A regular meeting of the Western Gas Engineers and Superintendents' Association was held this day, May 14, 1879, at the Tremont House, J. O. King, President, in the Chair, and Lee A. Hall, Secretary.

Meeting called to order at 10 o'clock A. M. The following gentlemen were proposed as active members of the Association, to wit:

T. A. Bates	Evansville, Ind.
George A. Farwell	Appleton, Wis.
John Gimper	Leavenworth, Kas.
George G. Ramsdell	Vincennes, Ind.
J. B. Howard	Dubuque, Iowa.
A. T. Averill	Cedar Rapids, Iowa.
James C. Stewart	Akron, Ohio.
Joseph M. Bate	Tiffin, Ohio.
Oliver Madson	Marshall, Mich.
D. W. Hunt	Oskaloosa, Iowa.
Alfred Odiorne	Springfield, Ill.
A. H. Barrett	Lousville, Ky.
C. C. Anderson	Marquette, Mich.
Thos. Smith	Grand Rapids, Wis.
Kerr Murray	Fort Wayne, Ind.
E. S. Rice	Logansport, Ind.
John H. Walker, Jr.	Peru and Lasalle, Ills.
Edw. Lindsay	Cleveland, O.
Thos. Butterworth	Rockford, Ill.
Chas. R. Saven	Toledo, O.
James M. Starr	Richmond, Ind.
H. T. Gerould	Cairo, Ill.
John Pinkston	Fort Scott, Kas.
M. N. Dial	Terre Haute, Ind.
L. L. Munn	Freeport, Ill.
T. A. Cosgrove	Evanston, Ill.
H. M. Putman	Monmouth, Ill.
P. T. Burtis	Chicago, Ill.
L. Perkins	Ottawa, Ill.
G. S. Redfield	Chicago, Ill.

Whereupon the Secretary, being duly authorized to cast the ballot of the Association, the above-named gentlemen were duly elected active members of the Association.

Committee on Constitution and By-Laws presented their report, which was received, and the committee discharged.

The Association then proceeded to the election of officers for the ensuing year; whereupon, Mr. J. B. Howard, being duly authorized there to cast the ballot of the Association, the following gentlemen were declared duly elected, to wit:

J. O. King, Jacksonville, Ill., *President.*

T. G. Lansden, St. Louis, Mo., *First Vice-President.*

Thomas Butterworth, Rockfork, Ill., *Second Vice-President.*

Lee A. Hall, Louisiana, Mo., *Secretary and Treasurer.*

A Committee of three was appointed to examine the books and accounts of the Secretary and Treasurer, consisting of Messrs. Butterworth, Howard, and Odiorne.

Letter received and read from Mr. J. C. Zabriski, Vice-President of the Association, stating that, owing to severe illness, he was unable to attend, and the Secretary was instructed to convey to Mr. Zabriski the regrets of the Association at his illness, and hopes of his speedy recovery.

The proposed constitution and by-laws were then taken up, pending the consideration of which the Association adjourned until 2 o'clock P. M.

two o'clock p. m.

The Association was called to order, President J. O. King in the Chair.

An invitation from Crane Bros'. Manufacturing Co. to the members of the Association to visit their factory was read and accepted.

The consideration of the constitution and by-laws was then resumed seriatum, and after several amendments and full discussion were adopted, as follows:

preamble.

Whereas, The manufacture and sale of gas for illuminating and other purposes has become one of the leading economic interests of the country, and

Whereas, It is necessary in order that its use shall not only continue at the head of all agents for the various purposes for which it is already used, but that its use shall be extended into newer and wider fields of usefulness, and

Whereas, It is absolutely necessary that those to whom its manufacture is intrusted should endeavor by every means in their power to reduce its cost to the lowest practicable point; thereby meeting the just expectations of the consumer as well as those having capital invested in its manufacture and distribution, and fully believing that united action on our part for mutual improvement will be an important step toward accomplishing so desirable a result, do hereby ordain and establish the following

constitution.

Article 1. The name and style of this Association shall be the Western Gas Association.

Art. 2.—*Qualification of Members.* Sec. 1. No one shall be eligible for active membership in this Association unless he is a regular gas engineer or superintendent, or an actual executive officer of a gas company. Sec. 2. The admission of special or honorary members may be provided for, but no such member shall vote or take part in the active management of the business affairs of the Association. Sec. 3. All elections to membership in the Association shall be by ballot taken at any regular meeting of the Association, and no one shall become a member except by a vote of at least three-fourths of all the members present.

Art. 3. *Officers and Board of Directors.*—The officers of this Association shall consist of a President, First and Second Vice-Presidents, and a Secretary and Treasurer, who, together with nine other members elected at the same time for the same purpose, shall constitute the Board of Directors—all of whom shall be elected by ballot, at the annual meeting, by a majority of all the votes cast; provided that, if for any reason the annual election shall not take place at the proper time, the Association may provide for a special meeting for that purpose not more than three months thereafter; but in all cases the elective members of the Association shall hold their offices until their successors are elected and qualified. Said Board, so constituted, shall be intrusted with the management of the Association, a majority of whom shall be necessary to constitute a quorum.

Art 4. *Voting and Eligibility to Office.*—Every active member not two years in arrears shall be entitled to hold any office in this Association; but no voting by proxy shall be allowed.

Art. 5. *Powers of the Association.*—The Association shall have power, 1st, to enact and inforce all by-laws and rules for the government of the Association or advancement of its interests that may be deemed necessary; and to alter, amend, or repeal the same at pleasure, and may provide such penalties as may be deemed proper for their violation by any member of the Association. 2d, to assess and collect such fees for membership and annual dues as may be deemed necessary for the purposes of the Association. 3d, to provide for a benefit fund to be paid to the family of any deceased member.

Art. 6. *Amendment.*—Any proposition to amend this constitution shall be submitted in writing at the annual meeting, seconded by a mojority of all the members present. Such proposition shall lay over and be printed with the proceedings until the next annual meeting. and if approved by a majority of all the members of the Association, shall become a part of this constitution, and not otherwise.

by-laws.

Article 1. *Annual Meetings.*—The annual meetings of the Association shall be held on the second Wednesday in May, each year, at such time and place as shall be determined at the preceding annual meeting, at which time the annual election of officers shall take place, and annual reports and settlements be made.

At each annual meeting the President shall present an address setting forth his official acts, and such general items and recommendations as he may deem of advantage to the Association.

All general business of the Association shall be transacted at the annual meeting, and the following shall be the order of business:

1. Calling roll and reading minutes. (May be dispenced with.)
2. President's address.
3. Presenting applications for membership and balloting.
4. Introduction of new members.
5. Reports of standing committees.
6. Reports of special committees.
7. Miscellaneous business. (May be laid over informally and taken up at any time.)
8. Special order, to consist of papers, drawings, models, or other matters of interest to the Association entitled to consideration under its rules, in the discussion of which all members of the Association shall be entitled to participate; and such special order may be considered at any time by order of the Association.

Art. 2. *Qualifications.*—Any person directly or indirectly connected with the management of gas works or gas machinery, or who may be skilled therein, shall be eligible as an honorary members of the Association. Such members shall be proposed, balloted for and received in the same manner and be subject to the same fees any annual dues as active members, and be entitled to all the privileges and courtesies of the Association, excep the right to vote, hold office, or participate in the management of its business affairs.

ART. 3. *Applications.*—Any person desiring to become a member of this Association shall make application in writing, setting forth name, residence, and occupation, with proper references, and signed by two members of the Association; provided no such application shall be acted upon until the fee for membership is paid.

ART. 4. *Fees and Dues.*—Fees for membership shall be five (5) dollars, and the annual dues shall be three (3) dollars, payable annually thereafter.

ART. 5. *Duties of Officers.*—Sec. 1. The President, and in his absence the Vice-Presidents, in their order, shall preside over all meetings of the Association or of the Board of Directors. He shall enforce all laws and rules of the Association; shall appoint all committees not otherwise provided for; decide all questions of order, subject only to an appeal; but in all such cases it shall require at least a majority of the members present to overrule his decision. He shall sign the records, and have general executive supervision of the affairs of the Association.

Sec. 2. The Secretary and Treasurer shall attend all meetings of the Association or of the Board of Directors, and shall make proper record of their proceedings. He shall have special charge of the books, papers, or other property of the Association; shall receive all moneys due the Association, and pay them out only by an order of the Association entered on the record. He shall read minutes and notices at all the meetings, and papers and communications, if the authors desire it. He shall also report such discussions and proceedings as may be ordered, and perform such other duties as he may from time to time be directed as proper to his office.

ART. 6. *Quorum.*—A quorum for the transaction of business shall consist of not less than 15 members; but a smaller number may adjourn from day to day, not more than three days, and in case of the absence of the President or other proper officer, they may select a chairman to preside over the meeting.

ART. 7. *Board of Directors.*—Sec. 1. The Board of Directors shall meet as such at least once in each year, on the the day previous to the annual meeting of the Association, at which time they shall determine in regard to the propriety of the various papers, drawings, models, or other matters constituting the special order being laid before the Association. They shall also examine and report on all applications for membership.

Sec. 2. Said Board shall annually, immediately on its organization, elect a Finance Committee of three of its own members, who shall have power to examine, at any time, the books and accounts of the Secretary and Treasurer. Said committee shall also, on the morning of the annual meeting, examine the report of the Secretary and Treasurer, and shall audit his accounts and report thereon to the Association; provided that no officer whose accounts may be subject to examination, shall, under any circumstances, be a member of such examining committee.

Sec. 3. Said Board shall also cause a record to be kept of their proceedings, which shall be read for approval at the annual meeting of the Association.

ART. 8. *Papers, Drawings, etc.*—All papers, drawings, models, etc., submitted to the Association at its annual meetings shall remain the property of the authors.

ART. 9. *Rejected Applications.*—If any person proposed for membership shall, upon being balloted for, be rejected, no notice shall be taken of the proposal in the minutes.

ART. 10. *Trial and Punishments.*—Any member may, upon conviction of violating any of the laws or rules of the Association, or of conduct unbecoming a gentleman, be suspended for a definite time, or expelled from the Association by a vote of at least a majority of all the members present, provided that any such accused member shall be furnished with a copy of the charges against him at least ten days before his trial, and be allowed an opportunity to appear either in person or by counsel for his defense.

ART. 11. *Rules of Order and Proceedure.*—The rules of order and proceedure of this Association shall be the same as that of other deliberative or similar bodies.

ART. 12. *Special Meetings.*—Special meetings of the Association may be called by the President, by and with the written consent of a majority of the Board of Directors. He shall cause notices to be issued to all the members of the Association, at least thirty days prior to such meeting, said notice to contain the business for which such meeting has been called, and no business other than that contained in said notices shall be considered.

ART. 13. *Amendments.*—These by-laws may be altered or amended only in the following manner:

1st. Any proposition to alter or repeal any existing by-law shall be presented in writing on the first day of the annual meeting, seconded by not less than three members; shall lie over until next day and be again read, and if approved by two-thirds of the members present shall become a part of the by laws, but not such alteration or amendment shall affect any question pending at the time of its adoption.

2d. Any additional section to these by-laws not in conflict with any existing by-law, may be adopted at any annual meeting upon being presented in writing, duly seconded, read twice, and approved by at least two-thirds of all the members present.

A committee of five, constsing of Messrs. Munn, E. J. King, Odiorne, Littleton and Butterworth, was appointed to prepare nominations for nine directors for the ensuing year, and instructed to report the following day at 9 o'clock.

The committee on books and accounts of the Secretary and Treasurer reported the same correct. Balance of cash in hands of Secretary and Treasurer, $85.75. Report received and committee discharged.

Mr. James M. Starr, by request, gave an interesting account of his experience with gas stoves, etc.

The following honorary members were, upon application, ordered to be transferred to the list of active members:

J. M. Armstrong, Hannibal, Mo.
James Green, St. Louis, Mo.

On motion, the meeting adjourned until the 9 o'clock A. M. of the following day.

SECOND DAY—MAY 15.

The Association was called to order pursuant to adjournment, J. O. King, President, in the Chair.

The committee on nominations for directors to serve for the ensuing year presented the following names for consideration, and were discharged:

A. H. Barrett, Louisville, Ky.
Wm. Dunbar, New Albany, Ind.
E. Lindslay, Cleveland, Ohio.
J. B. Howard, Dubugue, Iowa.
George A. Farrell, Appleton, Wis.
J. C. Zabriski, St. Louis, Mo.
John Gimper, Leavenworth, Kas.
A. W. Littleton, Quincy, Ill.
L. L. Munn, Freeport, Ill.

Whereupon the Secretary, by order, cast the ballot for the Association, and the above-named gentlemen were declared duly elected.

A Paper by C. J. Lewis Esq., on the Management of Small Works, was received and read.

Mr. Ed. Lindsay gave an interesting history of electric light experiments in the Park in Cleveland. Messrs. Murray, Lansden, Smith, and Butterworth also gave results of personal observation on the same subject.

P. T. Burtis, Esq., read a paper on the Electric Light, showing the result of his investigation of the subject in Europe, and especially in Paris; demonstrating clearly that up to the present time no practical plan has been discovered by which electricity can be utilized so as to make it a successful competitor with gas.

A communication from the American Meter Co. to visit their agency in Chicago was received and filed.

The meeting was then adjourned to 2 o'clock P. M.

TWO O'CLOCK P. M.

The Association met pursuant to adjournment, J. O. King, President, in the Chair.

Mr. P. T. Burtis extended an invitation to the Association to visit the works of the Chicago Gas Light and Coke Co., which was accepted, and it was decided that the Association would visit as a body, starting Friday, May 16, as follows:—Works of Chicago Gas Light and Coke Co.; works of Crane Bros'. Manufacturing Co.; agency of American Meter Co.

On motion, duly seconded, it was ordered that the *Plumber and Sanitary Engineer* be declared the official organ of this Association.

The following gentlemen were duly elected active members of the Association:

H. M. Thompson, Elgin, Ill.
Edwin Lee Brown, Evanston, Ill.

On motion, duly seconded, it was ordered that the Secretary be allowed as follows:—for the past 8 months, $50; for the ensuing year, $75.

The following resolution was adopted and ordered to be placed on the minutes:

Resolved, That the thanks of the Asoclation be tendered to Hon. Thos. Butterworth for his able minority report from the committee of the Legislature of the State of Illinois, to which was referred a resolution for the State to establish gas works for the gas to be used in the State House and the public institutions of the State—a scheme, it is believed, gotten up for private benefit, and if adopted would bring the State in direct competition with a large number of citizens, and with a large amount of capital invested in one of its most important industries.

On motion, duly seconded, it was ordered that the next annual meeting c

the Association be held in Indianapolis, Ind., and that the same be continued through three days.

The following bills were presented, allowed, and ordered paid:

J. O. King, postage	$8 00
T. D. Price & Co., printing circulars	5 50

On motion, the meeting was adjourned until 10 o'clock of the following day.

THIRD DAY—May 16.

The Association met pursuant to adjournment, J. O. King, President, in the Chair.

Mr. W. Misenkop (Princeton) was duly elected an active member of the Association.

On motion it was ordered that Wm. Dunbar, Esq., of New Albany, Ind., constitute a committee of one to make arrangements for the next annual meeting of the Association at Indianapolis.

The vote by which the *Plumber and Sanitary Engineer* was declared to be the official gazette of the Association was then reconsidered. The original resolution was amended by striking out the words *Plumber and Sanitary Engineer* and inserting the words American Gas Light Journal; and said resolution, as amended, was adopted.

The Secretary was also ordered to correspond with the members of the Association in regard to papers to be submitted to the Association, and to notify the members of the Association, at least one month before the annual meeting, of the subjects that will be presented to the meeting, and by whom.

The thanks of the Association were tendered to J. O. King, Esq., President of the Association, to the Tremont House, and to the Press of the city of Chicago, for courtesies to the Association.

No further business appearing, the Association then adjourned.

Lee A. Hall, *Secretary.*

MINORITY REPORT.

The following is the minority report of Hon. Thomas Butterworth, referred to above:

To the Honorable Body, the 31st General Assembly of Illinois:

Gentlemen—As a part of your committee to whom was referred the matter of investigating the different machines and methods of making gas for illuminating purposes—with reference to finding out the cost thereof, and report to the House if the facts in the resolutions of Hon. Jacob Wheeler, setting forth that coal gas could be manufactured at a cost of fifty cents per thousand cubic feet could be substantiated, the undersigned begs leave to offer a minority report.

1st. That while it is publicly known that there are over one thousand machines and methods of making gas from any and almost all substances capable of yielding gas, yet in every case where sufficient care has been taken to investigate, it has been proved beyond any doubt that coal is the only material that will yield a gas sufficiently charged with those hydrocarbons that contribute to its illuminating powers; and at the same time yield a gas of such a permanent character, as to its constituents, to enable it to be manufactured, stored, and distributed as a commercial success.

2d. Your committee visited and inspected a gas machine on the 7th of March, on an invitation from the Illinois Coal Gas and Coke Company—a corporation said to be doing business under the laws of the State of Illinois, of which Jasper N. Reece is the president; James D. Brown, superintendent: H. B. Buck, John Lamb, J. D. Brown, Charles Edwards, directors, and J. M. Rippey, engineer, who claim to be making gas from Illinois coal under Irland's patent, and the machine so shown was claimed to be Irland's, they having had it put to work on Monroe street, in this city, for our view. The machine had been at work for some time when we arrived, and a portion of gas had been distilled and passed to the gas holder. Our chairman stated that he had weighed the coal, and seen it put in the retort some two hours before; that the coal weighed just twenty-three pounds. (Why the full committee was not invited to be present to see the coal put in the retort I do not know.) There was no account kept or weight taken by our chairman, of the coal used under the retort for fuel, and that being one of the elements of cost in distilling gas, ought to be weighed and the cost thereof noted with as much certainty as the coal put into the retort. The undersigned was present for nearly three hours, and during that time there were brought in and used, two hods of coal that weighed in the aggregate over forty pounds.

3d. While the process of distillation was being carried on, the undersigned called attention to the following conditions, as being absolutely essential to forming a correct estimate of the amount of merchantable gas for illuminating purposes, manufactured by any machine or process:

First.—That each and every part of the combined machine should be open to inspection, so as to verify the fact that no other ingredients or materials were being used for making gas but the article claimed to be used, viz: coal.

Second.—That the retorts should be so far removed from the other parts of the combined machine as to allow proper refrigeration and condensation to take place.

Third.—That no gas should be measured at a temperature of over sixty degrees Fah.

Fourth.—That a meter of proper size in proportion to the amount of gas being made, should be used, and no other.

Fifth.—That the meter should be connected on the line of pipe after the gas has been condensed and purified, but before the gas enters the holders for storing (this last proposition is an absolute requisition to enable a correct estimate to be made of the amount of gas being distilled over of a merchantable quality). None of the above conditions were complied with. On the contrary, it was quite the reverse. The furnace and retort were scarcely six feet from the holder or any other part of the machine, so that the gas was put forward for our inspection at over ninety degrees Fahrenheit. The room became so hot as to be almost unbearable. The meter used was totally unfit for the purpose, having no means of correctly indicating less than 100 cubic feet, and the meter being placed to measure the gas as it came from the holder, not as the gas was made and put into the holder, no fair minded man can tell how much merchantable gas was being made from the twenty-three pounds of coal said to be in the retort, from any information the meter used was capable of giving him. Neither was there anything to indicate when all the gas sufficiently pure to be merchantable had been distilled over and purified, and no illuminating gases carrying over with them impurities, such as carbonic oxide, sulphurated hydrogen, and sulphur, in its many varied forms, commenced to come over from the exhausted coal in the retort. This omission to provide means absolutely required to arrive at a fair knowledge or understanding of the amount and quality of gas made (and no person who is versed in this branch of manufacture will dare to deny these being essential) was either done through ignorance, or a premeditated attempt to mislead us. I lay it to ignorance in all charity. The amount of coal said to be in the retort by our worthy chairman, ought to, and really did, make fifty-five to sixty cubic feet of fair average commercial gas, such as is made from Illinois coal of about twelve candle power, and no more. After waiting until sufficient time had expired to allow the above amount to be made, and from signs learned from experience, upon testing the purifiers and finding impurities had commenced to distil over in such quantities that the test papers held in my hand over the jet were tainted (and also the test papers in my vest pocket that I had prepared in reserve, although the papers were inside an envelope) showing me that the gas had become so foul that no gas company would dare send such stuff out to its consumers.

There was used in the retort twenty-three pounds coal; fuel under retort, over forty pounds of coal, total amount of coal, sixty-three pounds; cost six and one-fourth cents per bushel; gas made fit for use, not over sixty cubic feet, costing, for coal alone, at the rate of about one dollar for one thousand cubic feet. This experiment was nothing more nor less than a laboratory trial, and not giving any real information whatever. But on the twenty-sixth day of March your committee went by invitation to see a works built by the same company, under Irland's patent, at the works of the Springfield Watch Co. We found the machinery out of repair, and not making gas, but on looking over the books kept by the man making gas, we found that the watch company commenced to make gas by Irland's machine on the twentieth day of November, 1878. From that day to the twenty-sixth day of March the meter showed 134,150 cubic feet to have been made and used in one hundred and twenty-five days. There were charged to the gas made:

1897 bushels of coal, said to cost 7 cents	$132 79
28 pounds of lime at 80 cents	22 40
Man at gas making 125 days at 25 cents	31 25
1 retort completely used up	33 00
Interest on $900.00 (cost of Irland's machine) at 25 cents per day	31 25
134,159 cubic feet of gas cost Watch Co. $1.87 per 1000 feet	$250 69

Or at the rate of two dollars per day for gas made and used. In the bill of cost nothing is charged for the interest on cost of gas tank, work or material, not for gasholder, balance weights, guides and chains, gasholder inlet or outlet or connection, gas meters and connection to factory, the gas house building in which Irland's machine works, repairs, taxes or insurance on same.

All this property has to be used for making the gas, and it was owned and paid for by the Watch Company before Irland's patent was used. But interest and repairs on same are a part of the cost of the above made gas, and when a reasonable sum is allowed for same, the cost of gas will be thirty-three per cent. higher than shown above.

In the Secretary of State's report, on page sixty-nine, it is stated that lighting the State House cost, in round numbers, eight thousand dollars for

the past two years. From the first day of January, 1877, to the first day of January, 1878, there was used :

1,417,300	cubic feet ;	paid for same	$4,605 01 in same time.
878,900	" "	" " "	2,369 69 " " "
Total.....	2,296,200		$6,974 70

Or in round numbers one thousand dollars less than reported. The same amount of gas, viz.: 2,296,200 feet, at present prices, or two dollars and fifty cents per one thousand cubic feet, will cost $5,740.50 for two years ending January 1, 1881, or at the rate of $2,870.25 per year, and it cannot possibly cost any more unless the gas be willfully wasted.

To build works by the state in competition with the above facts, would be simply nonsense and a reckless use of the people's money ; and would tend to put a small army of leeches on the State treasury, who would be retained, not for their ability to make gas, but to be useful in the interest of some politician. It would be particularly unwise to use the people's money at this time. If you take in consideration the advance made in lighting large buildings by electricity within the last two years—in fact, what with coal oil and electricity—gas property is not the desirable kind of investment it was a very short time ago. Therefore, be it

Resolved by the House of Representatives, That it is at present inexpedient and unwise to undertake the erection of gas works on its own account, and that the Secretary of State be and he is hereby instructed to let the lighting of the State House and grounds to the lowest responsible bidder, at so much per thousand cubic feet, after advertising for bids for lighting the same in a newspaper having the greatest circulation, published in the city of Springfield. The successful bidder to give bond to furnish a full supply of gas at any and all times as may be required for use by the State. The gas to be pure and of good quality as can be made from Illinois coal, giving a light equal to not less than thirteen candles (when burning—at the rate of five cubic feet per hour, in a burner best suited to the gas so furnished.) Each candle consuming one hundred and twenty grains of sperm per hour. The gas to be free from ammonia, carbonic acid, sulphurated hydrogen or sulphur in any other forms not to exceed thirty grains in each hundred cubic foot of gas so furnished. Under the penalty of forfeiture of one hundred dollars per day for each and every day gas is furnished of a less illuminating power, or containing over the amount of impurities above specified, or not in sufficient quantity to meet the demands of the State.

THOMAS BUTTERWORTH.

[From the "Journal of Artificial Light."]

West of Scotland Gas Managers' Association.

[Continued from page 251.]

PRESIDENT'S VALEDICTORY ADDRESS.

The President then said : As my term of office as your president expires to-day, it is necessary that I should offer some remarks on a few subjects more or less interesting to us all. In doing this I shall be as brief as possible, but before entering upon these matters, I cannot help expressing to you the great pleasure it gives me on observing so many of the profession and others met here to-day. If the number of gentlemen here assembled—many of them from great distances, and here I have no doubt at considerable inconvenience to themselves—might be taken as an evidence of the great interest shown in the affairs of the association, then I say we have every reason to congratulate ourselves, for it proves that our association still continues to have a vigorous growth, and also the attention given by the outside public to the various subjects that are from time to time discussed by us. This association is now in the eighth year of its existence, and I presume there has been no year in its history in which there has been felt more anxiety as to the future of gas manufacture than the year just closed. During which time we have had very prominently forced upon us a new method of public lighting, viz., that by electricity, the introduction of which, it was thought at one time, would revolutionize our whole system of artificial lighting. This naturally caused some anxiety to prevail for a short time amongst those having charge of gas works, and others interested, but happily we can all now look back and say there was no necessity for alarm, as this new mode of lighting by electricity has been pretty generally and fairly tried all over the country, and for the present at least has been found wanting both in general utility and cheapness as compared with gas. Nevertheless, it is undoubted that whatever the majority of gas managers might think there was at one time in the minds of many proprietors of gas works great anxiety as to the future value of their property. This feeling no doubt gave rise to great timidity in entering into any extension of works or mains, although from the present depression in trade and consequent cheap material and labor market, there never was a better opportunity to carry out economically and such extensions. The late scare respecting the electric light has not been an unmixed evil, for it has discovered both to gas consumers and gas works proprietors that there is latent in gas and gas manufacture an undeveloped power. Gas consumers have discovered the fact that not only is gas a very cheap mode of lighting, but it is also very convenient and readily got at any moment. It is not necessary to make elaborate preparations by the erection of costly machinery in order to burn gas ; the means by which gas is supplied do not readily get out of order, and when they do the remedy or repair is simply and inexpensively made. It is true that to burn gas with efficiency and economy it requires more thought and care than has hitherto been bestowed upon it, but it does not require anything like the care and attention that must necessarily be devoted to the machinery for producing the electric light ; in fact, if only the same attention was given when consuming gas as when burning oil or candles, not only would a better percentage of light be obtained from the quantity of gas burnt, but a great saving in the expense or cost of the gas would be made. We gas managers are modest men, and do not care to be constantly before the public lecturing and advising the consumers as to the best method of burning gas. Still, it is necessary from the want of knowledge displayed as shown by consumers in this matter that we take more prominent steps than we have hitherto done to draw attention to this subject, and the fact that there is almost as much skill required to consume gas efficiently as to make it must be our excuse. Thanks to the labors of Mr. Peebles and others, consumers have a means upon which they may rely with certainty of controlling the supply of gas at the point of consumption so as to have an unvarying quantity passing through each burner. Mr. Sugg, of London, has also rendered good service in showing what gas can do when burnt in large quantities and in suitable burners. Many kinds of reliable burners are now to be got. We need, therefore, have no difficulty in pointing to what are suitable or unsuitable burners, and if our suggestions are adopted we may reasonably hope that consumers will be able to consume the gas as it ought to be consumed. It will thus become a public advantage that managers of gas works have been aroused to the fact that not only must they endeavor to get gas consumers to give greater attention to, and also to adopt the means that science has shown to be necessary for efficiently and economically consuming gas, such as having the piping throughout the houses of ample size and properly fitted—as also burners of a large size and of a non corrosive material so as to have unvarying apertures that the gas may issue in an equal manner and present when burning a flame of an equal and constant shape, but also by the use of gas regulators to have the supply unvarying in quantity or pressure, there cannot be any doubt that a great deal of the feeling against gas suppliers that frequently exists in the minds of gas consumers arises from ignorance on the part of the latter of the proper method of consuming gas, which causes that great irregularity in the quantities of gas consumed in similar periods of time, and which irregularity is often put down by consumers to deficiency in the quality of the gas or something dishonestly done by the suppliers of gas which causes the gas account to be larger at one time than another, but no doubt as this ignorance disappears and consumers are made aware, through paying more careful attention to the mode of consuming the gas, and find that their accounts are more uniform in amount, they will acquire greater confidence in the gas manufacturers, and any suspicions they may now have would be dispelled through the saving of gas that would be effected.

Proprietors of gas works have also seen that to keep up the value of their property and to provide against any casualty that may arise from the introduction of other systems of lighting, it is necessary that they should endeavor to find other uses for gas as well as that of giving light. The question of heating by gas has hitherto, especially in Scotland, received very little attention. In England more attention has been paid to this, and in many manufacturing towns there is a large consumption of gas for heating purposes alone, and English gas manufacturers are becoming daily more alive to the importance of improving this branch of their business. To do this exhibitions of gas heating appliances, gas engines, etc., are being held in all parts of the country and with great success and advantage, and not only so, but some gas companies are taking up the plan of letting stoves out on hire and even doing cooking on a large scale for nothing to encourage that plan. We, in Scotland, have done nothing or very little in this way of public demonstration to show the advantage in cleanliness and economy to be derived by using gas for heating purposes. To use gas in cooking stoves, gas engines, or for heating of shops and dwelling houses is certainly a step in advance, but even these are but a few of the many uses for which it might be used, because there is no reason why gas should not be applied to every purpose for which fuel is at present employed. By the use of tubular boilers (very small tubes might be used) there is no doubt steam could be raised for all purposes of a stationary character, such as in mills, factories, etc., with greater economy, convenience and rapidity, than with coal as now ; and at the same time do away with the great smoke nuisance in towns, and which makes our manufacturing centres often so unpleasant to live in. It is scarcely possible to realize the immense improvement that

would take place in all towns, the saving in health and property ; if all the heat required for raising steam, warming houses, cooking, etc., was supplied from the gas works. That this is not an extravagant idea is shown by the fact that it is done every day, but on a much more limited scale than might be, and we have only to remember that except for about one-third of the year a great portion of the manufacturing and storage plant of a gas works is comparatively idle, to see at once how important to gas manufacturers is this question of utilizing gas for raising steam and heating purposes generally, not only would our plant be better employed but from the greater quantity of gas supplied it could be sold at a much lower rate and so render competition by any other mode of lighting the more impossible. You will have an opportunity to-day of inspecting the handsome new works of the Coatbridge Gas Company, and which have now been opened. I cannot do better than call your attention to the works in their various details, seeing it gives me an opportunity of comparing the present position of gas making with what it was some years ago. This will enable us to recognise the many improvements that have taken place of late, and the directions these improvements should continue to take. It has frequently been said that little advance has been made for many years in the different apparatus connected with gas manufacture, but although it may be true that the processes are very similar, an inspection of these works will at once show great strides that have been made in all the details of the processes of gas manufacture during the past few years. Instead of the narrow, dark and confined retort houses with low roofs, you will see retort houses both spacious and lofty, well lighted and well ventilated. Retort houses are now constructed of ample span, and, in this instance, only separated from the coal stores by cast-iron columns, so that these stores form one with the retort-house. There is consequently larger air space, the height of the roof prevents all chance of the men being annoyed by heat, smoke, or steam, they have perfect freedom to do their work, and that with as little fatigue as the nature of the work will admit of. All these improvements recognising the principle that economy in the retort houses is not only affected by having a well arranged retort bench, but also by giving the workmen ample light, air, and space, in which to do their work. Under these circumstances the men will work with better heart, with less wear and tear to themselves, with less confusion and more cleanliness, and I am sure more efficiently and more economically than in a retort house of the old school. By an excess of retort power, and ample room for extending the same, the advantage is taken in a great many works of almost entirely doing away with Sunday labor. This great improvement, which I am glad to say, is being adopted everywhere that it is possible to do so, is not only a great boon to the workmen but also to the gas manager, and is one that we know the proprietors of gas works have at least no reason to regret. In these works you will observe that the exhauster boilers are in the retort house, so that all the furnaces is confined to the one house, but there are many matters of detail, including a new arrangement of dip-pipes, to which I do not refer. as Mr. Mitchell has kindly made this the subject of a paper which he will read to-day. There are some matters in connection with the roof and other portions of the retort house which it will be well to take note of ; for me to go into them would take up too much time. The condenser arrangements are not yet finished, but you will notice that instead of the old-fashioned plan of having only one condenser, through which the whole of the gas must pass, no matter how small the make may be or how low the atmospheric pressure ; we have here an arrangement by which the condensing power can be adjusted to the necessities of make or temperature. This is another stride that has been made in the process of gas manufacture. We still condense the gas in a similar manner to that formerly done, but instead of a "hap-hazard" sort of a way the condensing of gas is now carried out with a knowledge of the principles and necessities of what is required. We know that if the gas is condensed too rapidly or the process is carried on too long, the temperature of the gas is reduced to a very low point, that it will be seriously robbed of its illuminating constituents to the advantage only of the tar distiller, and again if the gas is allowed to leave the condenser at too high temperature the after process of purification will be seriously impaired. It is evident, therefore, that the process of condensing is one requiring careful attention, and if we wish to conduct the manufacture in keeping with the present knowledge and experience of this important part of purification we must now guide ourselves by the use of thermometers and increase or decrease our cooling surface as necessity requires. If anything was wanted to show how much exhausters are felt to be a necessity, and how much they are appreciated, an inspection of the handsome exhauster erected at these works will be sufficient. They are by English makers (Messrs. Dempster & Sons, of Elland), and are of beautiful workmanship and finish. The question as to whether exhausters do assist in materially causing the coal to yield an increased quantity of gas, is, we know, disputed by some of our members, but there cannot be a doubt in the minds of any that have used them that, during what may be called the lifetime of a set of retorts, certain contingencies arising from wear and tear, old age, or accident, which necessitates retorts being patched and repaired, that these repairs are effected at a serious loss of gas unless an exhauster is used ; but even in the case of new retorts it is of advantage to have the back pressure due to the weight of holders and friction reduced to a minimum for no attempt is made, of course, to remove any of the pressure due to the barometric pressure of the atmosphere, as that would be destructive to the quality of the gas. It is a well known fact that the exhauster assists in keeping down carbon accumulation, and that it also relieves the labor of the stokers in closing the retort lids. In fact, I know of no more valuable agent in a gas works, and although many of our members cannot afford to emulate our Coatbridge friends in this matter, still there are many simple and inexpensive arrangements of gas exhausters that might be adopted, and beyond the first cost there need be little outlay except cost of fuel, while the engine that drives the exhauster may be made to do much necessary work, such as filling casks with tar, working scrubber pumps, &c., although it is better to have the latter work-apart, still in a small work it is impossible to have all we could wish. In the scrubbing or washing of gas, as now conducted, it is again noticeable that some advancement has been made towards bringing this department of our manufacture as near perfection as possible. It is now recognized that not only must we remove the ammonia as a means of purification, but it is also advantageous to do so as a matter of profit. It is impossible to work up the gas liquor to a marketable strength in a single scrubber without loss of ammonia, for no matter how efficiently the scrubber may act in enabling the ammonia to combine with the sulphur and carbonic acid compounds there is always some free ammonia which, when the liquor is worked up to beyond a certain strength, will leave the liquor and pass off with the gas, to the loss of ammonia in a marketable form, and necessitate its being removed in the after process of purification. To enable the whole of the ammonia being obtained and to allow of the liquor being worked up to a good strength —it is necessary to have two or more scrubbers. It is also now acknowledged that to overwash the gas is also objectionable, and it is evident that if only one scrubber is employed, and that sufficient to do the work during term of maximum make, that when only a small quantity of gas is passing through the scrubber the gas is liable to be overwashed ; but when two scrubbers are employed, as in these works, the washing can be adjusted as circumstances may require.

The pipes and valves in connection with the condensers and scrubbers are here all above ground, and an inspection of these in detail will be of interest to all. Although we are still looking for means by which a saving of labor and material can be effected in the complete removal of sulphurated hydrogen and carbonic acid, still in our purifiers as now constructed we again see that we have made an advance upon old practice in having ample surface in proportion to quantity of gas made, ample room for getting about them, and plenty of freedom for the escape of all offensive smells, so that the men in cleaning the purifiers can work with some degree of comfort, convenient means for removing the spent and bringing up the fresh lime, all showing that, although we use dry lime in same manner as when that process was first introduced, it is now done in a more rational and scientific manner. In the gasholders the advantages of ample storeage is recognized, and seen that it is a point of true economy. We all know that it is no gain to be confined to a storeage that will only meet our necessities from day to day, and also that there is scarcely a more profitable investment of capital in any part of a gas work than in that of erecting a gasholder of surplus capacity. The advisibility of surplus yard room, with convenient and ready means of extension, is now too well known to need comment, and this has been well attended to in the present instance. These works are not only a credit to the directors of the company in showing their foresight and endeavor to keep up with the improvements of the age, and to their engineer, Mr. Mitchell, the designer, of the works, but I am sure their careful inspectien by us to-day will not be the least profitable and instructive of our proceedings here.

It is well to bear in mind that we are progressing in knowledge, that we, in conducting the various processes of gas manufacture, have become more scientific, more expert in designing our apparatus to arrive more exactly at the ends we wish, and we are better acquainted in utilizing the raw material with which we have to do, getting at our results with less loss of material and the products derived from it, but at the same time we must not forget that there is still great room for improvement, and that there is still a great deal of crudeness in the process of gas manufacture. We have yet to perfect means of keeping our retorts at unvarying temperature—of preventing waste of gas while charging retorts—of providing and supplying gas of unvarying quality—of means of preventing the deposit in our retorts of the richer illuminating constituents of the gas ; and we have yet to bring into practical everyday working a means of conducting the process of purification without the necessity of so much handling of the crude material for purifying purposes, and to get at these advantages we have much scope for study and experiment. Before concluding I must thank the office-bearers and other gentlemen connected with our association, for the great and valu-

able assistance I have at all times received from them during the time I have acted as your president, and at the same time express my best wishes for the continued success of the association.

[To be continued.]

The "Gary Motor."

In a letter to the Secretary of the Franklin Institute, Professor Henry Morton, of the Stevens Institute of Technology, remarks concerning this application of magnetism for the production of motion as follows:

This so-called "Gary Motor" comes before the public in a double character.

First, as a perpetual motion machine, which is to do work without transformation of energy. In this light I think we may at once dismiss it as a fraud or a blunder, to take its place with materialization of spirits, and other matters, which are not subjects for the investigation of sciectific students.

Secondly, however, Mr. Gary appears as the supposed discoverer of some new facts in reference to the action of magnets, which, though they certainly can no more enable us to create energy than to create matter, may add to our means of utilizing natural forces and existing sources of energy.

In this view his claim of discovering what he calls a neutral line around magnets is worth investigation.

On looking into this matter, however, I find that he has only re-observed a set of phenomena which are so old as to have been described in the *Principia* of Sir Isaac Newton, Book II., Prop. xxiii, Scholium to Theorem, xviii, where I find as follows:

"The virtue of the magnet is contracted by the introduction of an iron plate, and is almost terminated by it; for bodies further off are not attracted by the mugnet so much as by the iron plate."

All Mr. Gary's experiments, which will work, are readily explained by the well-known principles of magnetic induction, by reason of which a piece of soft iron near a magnet is inductively magnetized by the same and reacts upon it, and thus "contracts the virtue of the magnet," and neutralises its action on exterior bodies.

There is no evidence whatever of the existence of any neutral lines about a magnet, but the very experiments by Mr. Gary as proving it simply demonstrate that in certain relative positions the opposing actions of a permanent magnet and a piece of soft iron magnetized by induction from it neutralize each others effects upon a third magnetic body, such as a piece of iron or a compass needle.

Fully to work out all the relations between the mutual actions of three such bodies in any case is of course a problem of considerable complexity, but by no means a new one, and among many others a very able discussion will be found in the *Philosophical Transactions* for 1831, by Sir William Snow Harris, page 501 et seq., under the title "On the power of masses of iron to control the attractive force of a magnet." An earlier memoir by the same author appeared in the Edinburgh *Philsophical Transactions* for 1829.—*Jour. Franklin Inst.*

The Danger in Kerosene Oil.

It is simply to be set down to good fortune if one who has employed the light oils for household purposes has escaped injury, since no amount of care can avail against the inevitable result which must follow one accident. It is easy to understand how persons ignorant of the highly dangerous character of the light petroleums may unknowingly make use of them in the manner above named; but it is really a matter of concern and surprise that so many, even of those who are thoroughly aware of the nature of the incendiary they are introducing into their households, are, nevertheless, thoughtless or indifferent enough to continue the suicidal practice—for no term can be too strong to properly characterize the fearful nature of the risk one is constantly running while employing these oils in the household.

There seems to exist a notion that the explosive or inflammable properties of the light petroleums can be effectually neutralized by adding various substances to them. The Patent Office records for the past few years contain numbers of claims for such mixtures of naphtha or gasoline, with a great variety of substances too numerous to mention.

Whether or not the inventors of these recipes really have faith in the claims they present is a matter of small importance; but the deceptive illustrations which they are able to offer in vindication of their assertions, no less than the attractive names which they attach to their incendiary mixtures, are the sources of many distressing calamities.

There is one simple and, for practical purposes, satisfactory method of determining the character of all such mixtures, and which applies equally as well to the common oils. Let a few drops be poured into a saucer and apply a match; if the material burns, reject it as unsafe. The fact that the material can be set on fire at the ordinary temperature of our dwellings should be sufficient evidence to a person of ordinary intelligence that, when employed in the household, it may, at the first thoughtless or careless act, become the cause of a frightful accident.

Now for the reason why the dangerous oils find their way into the market in defiance of legal prohibition:

The crude petroleum, as it comes from the wells, is not a simple substance, but consists of a mixture of a number of oils. The operation of refining the crude product consists essentially in subjecting it to a system of frictional distillation, whereby it is separated into some six or seven products, to which the commercial names of rhigolene, gasolene, naphtha, benzine, kerosene, etc., are attached.

The benzine or naphtha makes up generally about 15 to 20 per cent. of the crude oil, and for this the demand in the various industrial arts is by no means equal to the supply, in consequence of which it commands but an inferior price in the market; in fact, considerably less than that demanded for the burning oils proper. Here, then, exists a direct temptation to dishonest or ignorant manufacturers and dealers to adulterate their stock of burning oil with oils of inferior price and dangerous quality. To what extent this reckless practice is carried on the community have no just conception, but the writer feels safe in asserting that it is as general as any of the trade adulterations.

So general has it been practiced, in Philadelphia at least, that only three years ago an examination of 3,000 oil samples sold in various parts of the city and its subnrbs showed that not more than one-twelfth of one per cent. of all the burning oils sold in the shops of this city were of a sufficiently high grade to pass the fire test; and it may be added that there is no reason to suppose that any improvement of this condition of things has taken place since the time when the examination was made. The constant occurrence, therefore, of accidents with coal-oil—so long as the cheap and highly dangerous products of the refinery are indiscriminattly used to adulterate the comparatively safe-burning oil, the kerosene, or doctored, with equal impunity, into the numberless burning mixtures with alluring names that meet one at every tnrn—is a perfectly natural result, and one that should occusion no surprise. And so long as inspection is a farce, and inspector and vender are beyond the pale of legal accountability for their deeds of omission and commission, just so long will coal-oil murders and disasters continue to be deplored—*Polytechnic Review.*

Saponification of Mineral Oil.

Hitherto all experiments in the way of saponifying mineral oil have been a total failure, but after steady perseverance, which only commands success in scientific investigation, the French chemists fancy they have succeeded in founding what they term a benzine soap. The process has been patented in this country in the names of the invention M.M. Barbieux Rosier, of Marseilles—a fitting birthplace for an improver in soap manufacture. Their specification shows that, mineral oils being of a neutral character, have not been, as yet, combined with alkali to produce soap. The ordinary theory of saponification with vegetable and animal fat being that the fatty acid of the oil bears the glycerine, and combines with the alkali forming a salt, whilst the glycerine combines with the water set free from glycerine. As there are no fatty acids in mineral oils, no such reaction can take place, and as far as we can at present follow the process of the invention, we are very doubtful as to whether they have effected a free saponification. They first add a certain quantity of concrete fatty matter of either vegetable or animal origin. The resulting mixture is now saponified with ordinary alkaline lye.

In one part of the specification the proportion of fatty matter to mineral oil is stated to be 15 to 100, but it is afterwards recommended to first acidify the petroleum with a stiaric acid and then add fatty matter in the proportion of two of this acidified mixture to three of salts, and then saponify. The resulting mass would be, in our opinion, an ordinary soap holding in mechanical mixture a variable quantity of mineral oil which would impart valuable disinfecting properties. A similar process has been in use in an oil works not a hundred miles from Edinburgh for a long time simply because the buyers of a certain quality of oil desired it to saponify, so that the invention is anything but new. It is possible to mix neutral matter to a very large extent with soap, without causing decomposition as in the case under consideration, it is more than absurd to conclude that it is the petroleum that is saponified, and not the fatty matter, especially when there are no scientific reasons for concluding such to be the case. We are afraid that the saponification of mineral is a consummation yet to be accomplished; but that a petroleum soap, in the same sense as the glycerine soap, is a thing possible and already accomplished we do not deny, although we claim for Scotland the honor of the invention.—*Journal of Artificial Light and Sanitary Gazette.*

THE AMERICAN GAS LIGHT JOURNAL AND CHEMICAL REPERTORY

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MONDAY, JUNE 16, 1879.

Official Report of Examinations of Gas for two Weeks ending June 7, 1879, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

May. 1879.	Time of Day at which Test were made.	New York Gas-Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
26		15.70	17.07	18.53	17.05	15.32	
27	Between	15.82	16.88	18.53	17.16	14.84	
28	9.30 A.M.	15.80	16.97	18.33	17.05	15.64	
29	and	16.24	17.07	18.90	17.27	15.76	
30	1 P. M.						
31		15.84	16.91	18.32	17.70	16.60	
	Average	15.88	16.98	18.52	17.24	15.63	
June 2		16.36	16.86	18.85	17.56	17.42	
		15.82	16.84	17.86	17.62	17.71	
4		16.02	16.73	18.44	17.21	17.01	
5		16.09	16.58	17.96	17.28	16.97	
6		16.04	15.88	17.86	17.52	16.63	
7		16.44	16.86	18.50	17.29	16.36	
	Average	16.13	16.62	18.24	17.41	17.01	

Sugg-Letheby burner.

E. G. LOVE, Gas Examiner.

Absorption of Water by Wood.—E. J. Maumene finds that the absorption power varies in woods, when dried in a vacuum, between 9.37 per cent. and 174.86 per cent. The maximum, 174.86 per cent., or 7-4ths of its own weight, is found in chestnut timber. The moisture contained in wood, in its ordinary state, varies between 4.61 per cent. and 13.56 per cent. The absorption power varies little in different samples of the same wood.—*Les Mondes.*

Velocity of Light.

There are now in progress at the Naval Academy, preparations for a scientific investigation of an interesting character. Ensign A. A. Mitchelson, U.S.N., having delivered a lecture upon "Light" before an association of scientists, made in preparation for it a series of investigations that induced him to believe that he could determine more accurately than is now known the velocity with which light travels, the two accepted computations differing about a thousand miles in the distance asserted to be traveled in a second. Under orders from the Navy Department, Mitchelson has erected the apparatus to determine his theory practically.

The plan is essentially that used by Foucault, with the exception that a lens of great focal length, and a plane mirror, are used instead of a concave one. This arrangement permits the use of a considerable distance, and consequently gives a longer interval of time, which insures greater accuracy. The displacement of the image of a slit is the quantity to be measured, and this in Foucault's experiments was a fraction of a millimetre, and in the velocity of light could not be determined with any greater accuracy than could this displacement, which would be a fraction of one per cent. In the experiments made by Mitchelson the displacement has been increased to over one hundred millimetres; hence the error introduced by this measurement would be less than one-thousandth of the whole, or less than twenty miles.

Another, though not an essential feature, is the use of a tuning-fork, bearing a mirror on one prong, and kept in motion by a current of electricity, by means of which the speed of the revolving mirror can be ascertained with the same degree of precision. The mirror is put in motion by a blast of air furnished by a small rotary blower, which is driven by a steam engine. By this means a very steady speed is maintained. The entire apparatus is nearly finished, and in a short time observations will be commenced at Annapolis.—*Jour. Franklin Inst.*

Coke as a Fuel for Domestic Purposes.

Considerable attention is now being given in the West to the use of coke for domestic purposes—heating and cooking—more especially as a substitute for anthracite coal. The transportation of anthracite is controlled in the interest of one or two corporations, and in such a way that competition is impossible. These corporations charge what they please, and at many points the figure is outrageous. This has already led to the use of coke to some extent. Gas house coke has been used in places where it was obtainable, but the use of coke made in ovens, such as the Connellsville product has been very small. At Pittsburgh the coke from near the doors of the ovens which is softer and less adapted to smelting and foundry purposes than that from the interior, has been employed to some extent in large heaters or furnaces, and the waste from "forking" the coke is partially used, but the amount has been so small that it can be truly said that coke is not used for domestic purposes. At Altoona, however, as the result of trouble between certain dealers and the parties controlling the sale of anthracite coal, coke is being quite extensively used, there being a demand for 12 or 15 cars of an average of 12 tons each per week.

The chief hindrance to the use of coke for domestic purposes has been the popular notion that the ordinary anthracite stoves will not burn it readily and economically. Coke is a fuel of more bulk than anthracite, and it is supposed that the magazines and fire-pots of anthracite stoves would not be large enough to burn it. When it has been used properly, and with a knowledge of how it should be burned, but little trouble has been experienced. A more frequent firing has been necessary, and those accustomed to the use of bituminous coal have had to learn how to use coke, but with these exceptions there has been no trouble. With stoves adapted to burn bituminous coal no difficulty has been found, except perhaps that they consumed a little more than was needful. The self-feeders that are arranged for both hard and soft coal, are well-adapted to coke. We learn, however, that efforts will be made to put upon the market a stove especially constructed for coke. Another trouble has been the shape and size of the lumps of coke. These as they come from the oven are quite large, and long in proportion to the area of section. In breaking coke by the ordinary means the cleavage gives oblong cubical fragments, which renders breakers necessary to prepare the fuel for use. These need not be expensive, as in the case of anthracite breakers, but may be cheaply erected at the points of consumption, the coke being forwarded as it comes from the oven. The one at Altoona does the work satisfactorily.

There seems to be no reason why, in the West especially, coke should not come rapidly into favor, not only as a substitute for anthracite, but for bituminous coal. It is asserted that careful experiment has shown that a ton of coke has as much calorific value as a ton of anthracite coal. It certainly makes a quicker and clearer fire for cooking; it will last as long, pound for pound, or if not, what is lost in time will be gained in heat. It will keep in as well over night, and seems in every way to answer all the purposes of anthracite. In this matter we speak to some extent from experience having economically burned coke in an anthracite heating stove for a long time. and preferring it as a fuel for surface burners to any other we know of. Considering the cheapness and abundance of coke, the manufacture of stoves especially adapted to it offers a chance for profitable enterprise which some of our founders having a local trade in the coke regions will probably find it worth their while to look into.—*Iron Age*, April 17.

The Purification of Smoke and Noxious Vapors.

An apparatus designed for this purpose was lately tested at the works of Mr. B. Goodfellow, engineer, Mottram Road, Hyde, in the presence of several members of the Manchester Association for Controlling the Escape of Noxious Vapors and Fluids from Manufactories. The patentees are Messrs. Johnson and Hobbs, of Smedley Road, Manchester, and it may be stated that at the exhibition of sanitary appliances held in the Owens College grounds in August, 1879, they were awarded for this apparatus a certificate of merit.

Like many other useful inventions, that of Messrs. Johnson and Hobbs is of a very simple character. The apparatus may be described as consisting simply of an enlargement of the flue between the furnace and the chimney. In the chamber thus provided there are three paddle wheels fitted with projecting blades. The wheels revolve in a tank of water, and produce a fine spray, through which the smoke passes on its way to the chimney. The spray, which necessarily carries with it all the impurities which would otherwise be emitted from the chimney, falls upon three screens—the first consisting of coke, and the other two of wooden lattice work—and then falls into the tank beneath, from which it is raised. At the entrance to the chamber there is a large fan, by means of which the draught can be increased to any extent.

It is said that this machine when used with water alone will absorb from 75 to 80 per cent. of the sulphuric acid, evolved by the combustion of coal, and with the application of proper chemical solutions the whole of the acid has been absorbed. Mr. C. Estcourt, Manchester city analyst, has performed a variety of experiments with the machine, having been engaged in connection with it since August, 1877. At the testing a heavy fire was placed beneath the large boiler to which the apparatus is attached, and the smoke was by means of a damper turned into an ordinary chimney, in order that the visitors might see

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the effect, and, as might naturally be supposed, a volume of black smoke was emitted from the top. The smoke was then turned into the apparatus, and from the chimney connected with it, instead of black smoke, there proceeded a thin white vapor simply. The results of the trial of the machine were generally considered as most satisfactory.—*Iron.*

Increase of Meat Exports.—In 1876 the whole quantity of meat exported to Great Britain was 16,165,632 pounds. In 1878 the export had increased to 53,661,216 pounds.—*Fortsch. der Zeit.*

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
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Gas Co.'s of N. Y. City.

	Capital.	Par.	Bid.	Asked.
Central	466,000	50	60	75
Harlem	1,800,000	50	40	45
" Bonds	170,000			103
Manhattan	4,000,000	50	168	175
Metropolitan	2,500,000	100	125	128
" Scrip	$1,000,000		100	103
Mutual	5,000,000	100	65	75
" Bonds, gold	900,000	1000	98	103
Municipal	1,500,000	100	117	—
" Bonds	750,000		95	100
New York	4,000,000	100	95	100
Nothern	270,000	50	—	100

Gas Co's of Brooklyn.

Brooklyn	2,000,000	25	125	130
Citizens	1,200,000	20	60	65
" S. F. Bonds.	320,000	1000	100	102
Peoples	1,000,000	10	20	30
" Bonds	325,000	...	--	95
" Scrip	300,000	...	75	80
Metropolitan	1,000,000	100	60	65
Nassau	1,000,000	25	70	75
" Ctfs.	700,000	1000	90	95
Williamsburgh	1,000,000	50	70	75
" Scrip		...	90	95
Kings Co	200,000	100	—	70
Union Co. E. N. Y.		25	—	50
Richmond Co., S. I.	300,000	...	60	85

Out of Town Gas Companies.

Bath, Maine	70,000	100		
Buffalo Mutual, N.Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md	2,000,000	100	95	98
" Ctfs., gold	1,000,000		95	10
Bayonne, N. J		100		90
Brockport, N. Y	25,000	100	...	80
Citizens, Newark	918,000	50	100	103
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			128	130
Cincinnati G.& C.Co.				190
Derby of Conn	160,000	100	60	80
East Boston, Mass		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.		100	...	—
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	120	125
Hempstead, L. I.	25,000	100	...	—
Jersey City	750,000	20	145	155
Jamaica, L. I.	25,000	100	...	—
Jacksonville, Ill.	120,000	50	100	...
Lewistown Maine	400,000	100	70	80
Lima, Ohio,	60,000	100	—	...
Bonds	30,000		90	
Laclede St Louis Mo.	1,200,000	100	—	75
Long Branch		20	30	40
New Haven, Conn		25	152	—
Peoples, Jersey City		...	—	80
" " Bds.				95
Peoples of Albany	650,000	100	—	10
" Bonds	350,000	1000	--	--
Peoples of Baltimore		25	44	48
" Bonds			106	—
Plainfield, N. J.	80,000	100	—	105
Perth Amboy		25	—	95
Rochester, N. Y.		50	70	80
" Citizens		100	50	60
Toledo, Ohio			95	97
Washington, D. C.	1,500,000	20	—	200
" Scrip	500,000	20	100	—
Yonkers		50	70	80
Woonsocket, R. I.	150,000	100	80	...
Halifax N. S.	400,000	40	148	150
Hamilton, Ontario	150,000	40	117½	
Pittsfield, Mass.			120	130
Rondout & Kingston			75	80
St. Louis, Missouri	600,000	50	73	75
Stillwater, Minn.	50,000	50	—	26
Saugerties, N. Y	15,000	100	95	100
Troy, Citizens	600,000	100	—	60
San Francisco Gas-Co., S. Fr'isco Cal.			95	95¼

The Municipal Gas Company, of New York City, have declared a dividend of 3%, payable on demand.

The following sales were made at auction since our last report—

97 shares Manhattan, at 180—100 shares, at 170; 100 shares New York, at 97¼; six shares Metropolitan, at 128, and $240 scrip, at 102½.

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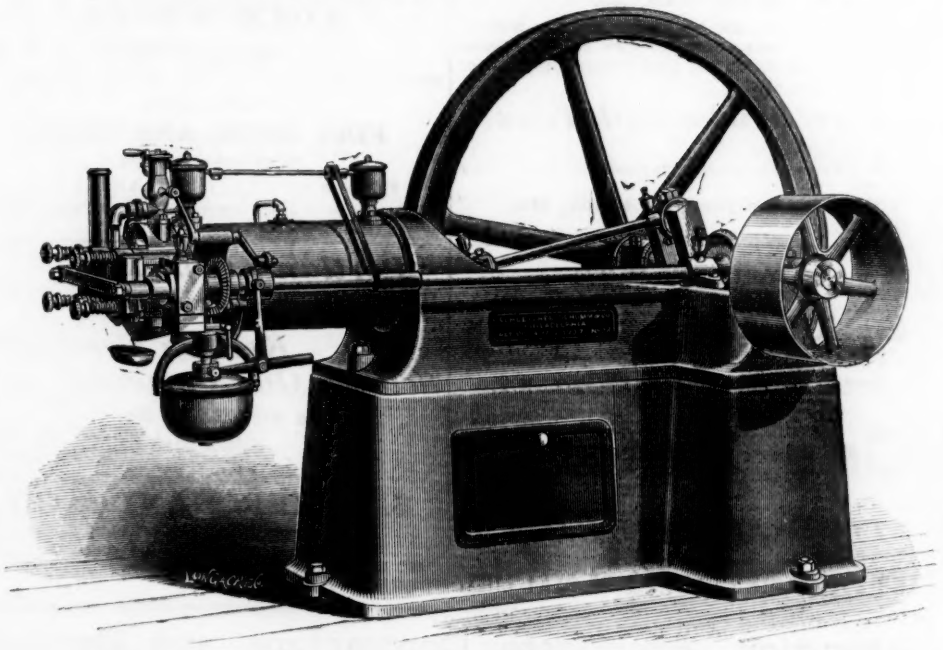

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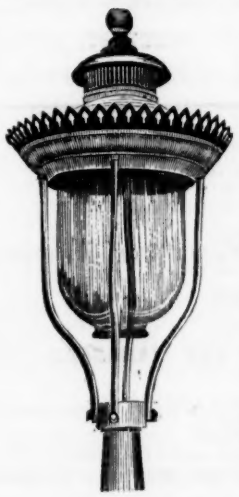

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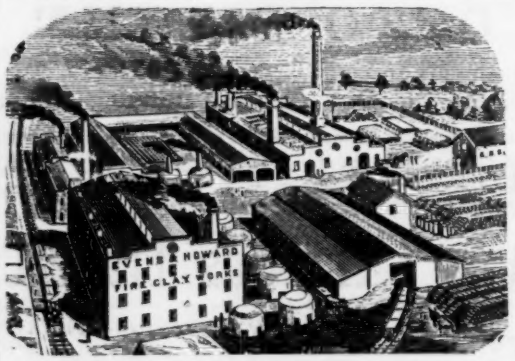

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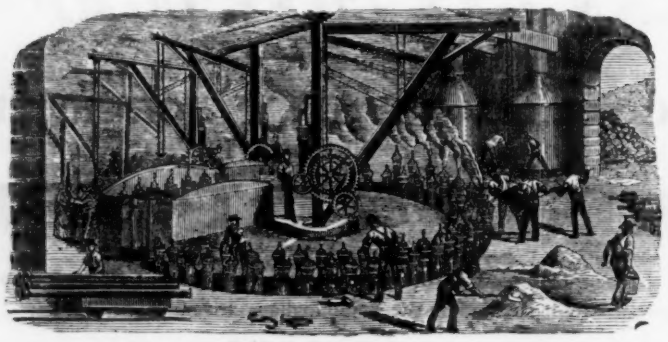

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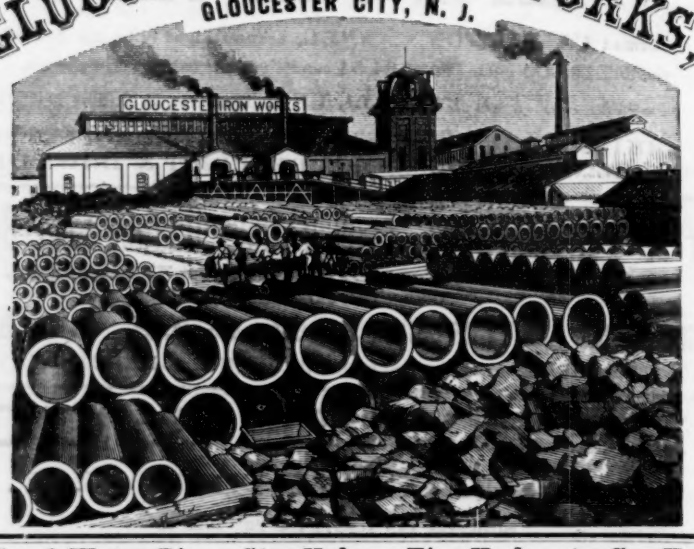

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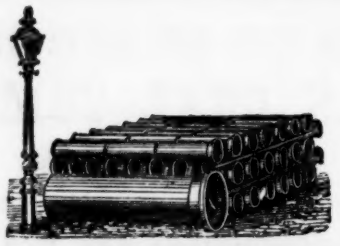

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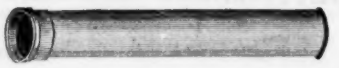

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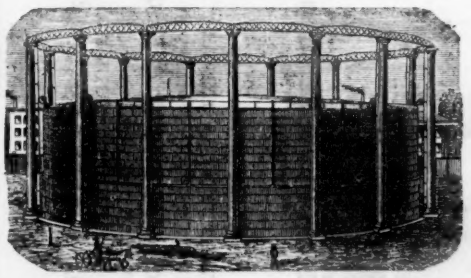

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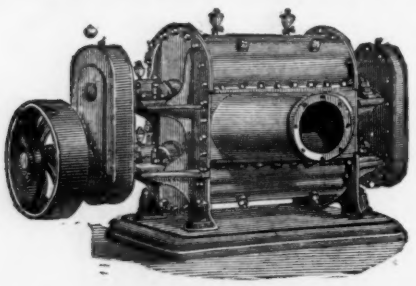

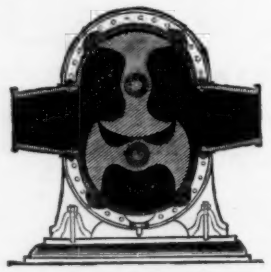

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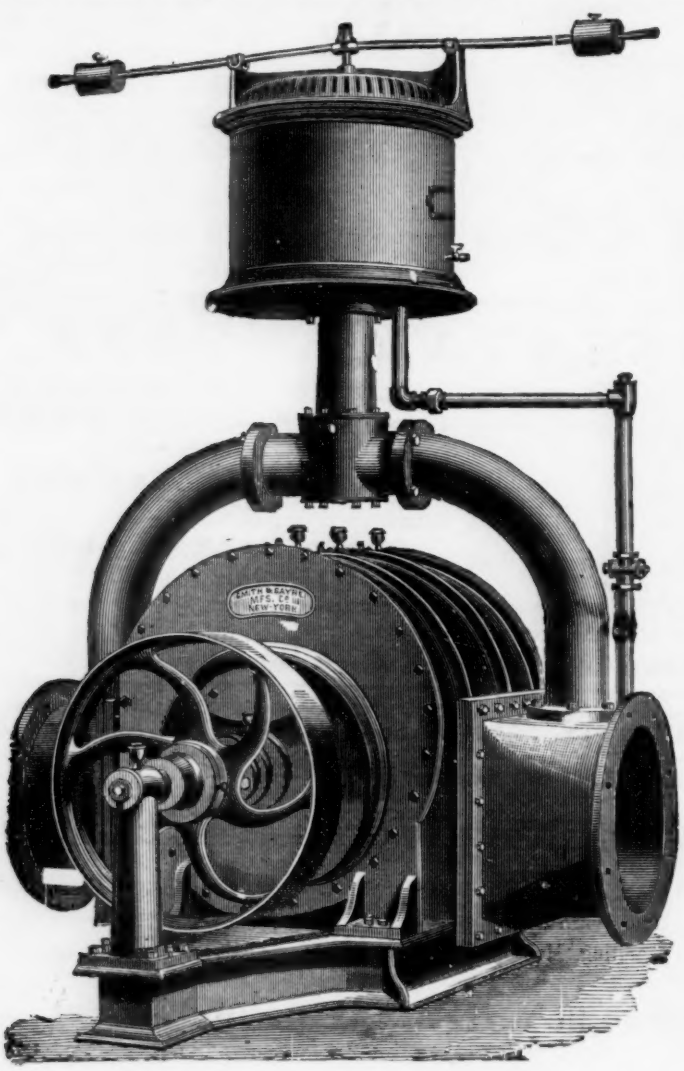

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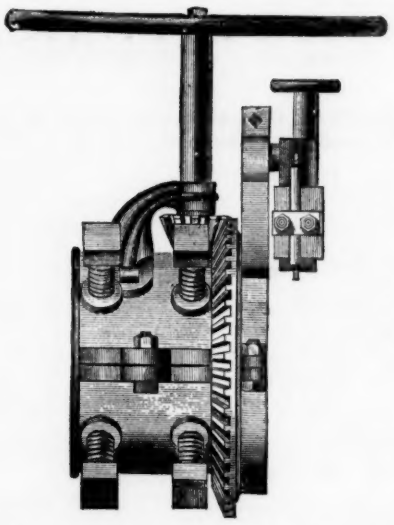

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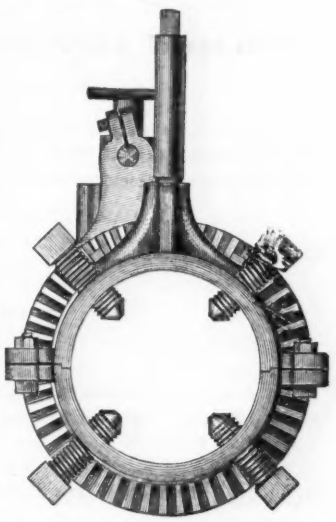

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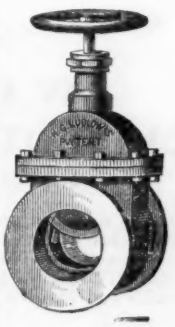

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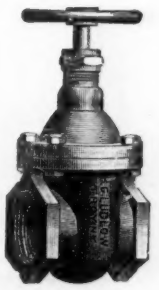

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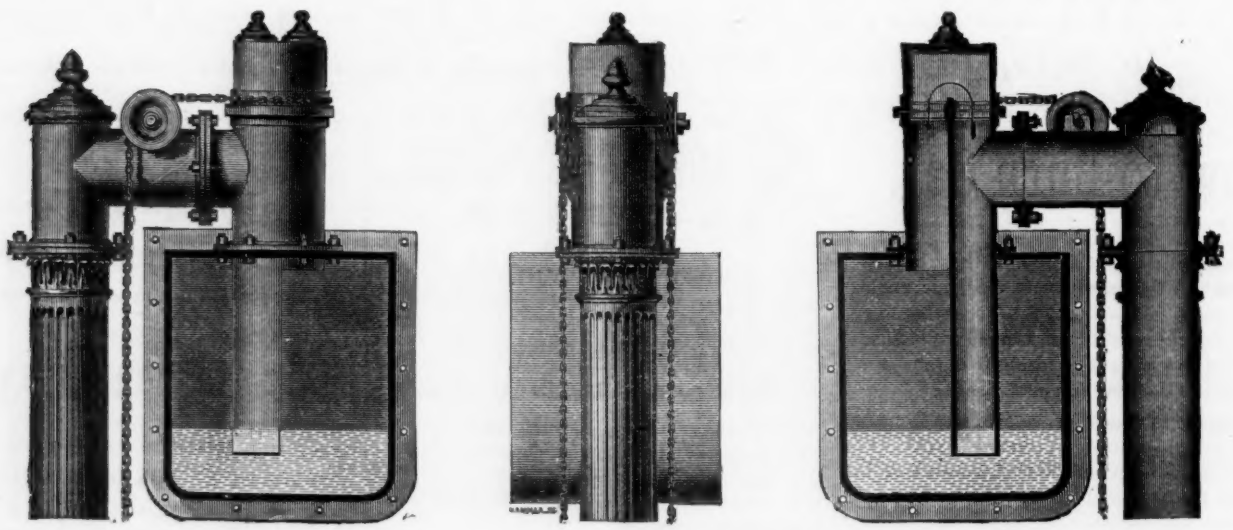

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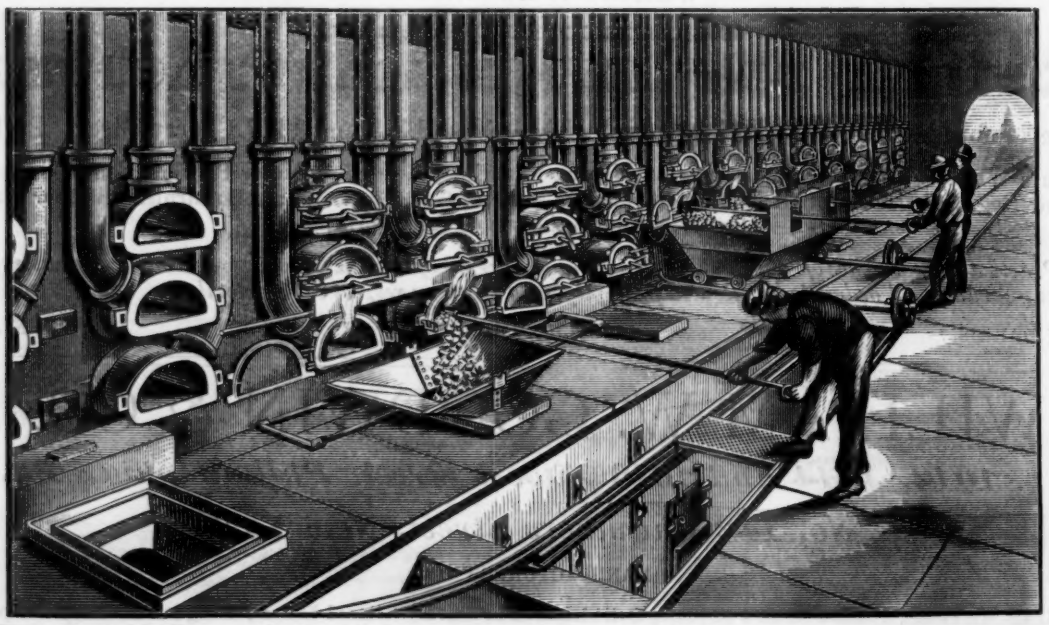

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